Vermont Family Forests and the LaForce Project

A Case Study in Local Sustainable Forestry

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Executive Summary

This report analyzes the process of choosing a lumber source for Middlebury College's LaForce Hall project. It takes a broad look at the community, economic, and ecological implications of the College's choice to use local green certified wood provided by Vermont Family Forests (VFF). We conducted interviews with VFF clients involved in several stages of the process. We found that those individuals and businesses who choose to work with Vermont Family Forests share a land ethic that draws them to sustainable forestry. They consistently mentioned the importance of personal relationships and a sense of community to how they conducted their business. Vermont Family Forests should continue to cultivate these relationships as it grows and evolves its brand name.

We studied the current state of green lumber certification. Our findings suggest that Vermont Family Forests should monitor its involvement with green certification systems. With several different green certification programs operating with different standards, the ambiguity in the marketplace has caused some people to question the ecological benefits and economic viability of green certified lumber. Vermont Family Forests could use green certification as a way of "branding" its product in the larger market. But it should continue to emphasize how its product goes beyond green certification towards a vision of sustainable forestry that involves local communities and individuals. The Family Forests model of forestry may be even more attractive to consumers who are already interested in buying green certified lumber than any green certification systems currently operating.

Our economic analysis suggests that VFF can be most competitive when it uses species with low stumpage rates. In doing so, the premium it must charge on its lumber is less likely to result in a total cost that is prohibitively expensive for consumers. With VFF's supply driven forestry model, it must continue to expand its inventory by recruiting new landowners to participate in its program. Continuing to pay landowners double the stumpage rate for their logs ought to provide incentives to help with recruiting. Finally, Vermont Family Forests benefits from providing customers with transparency in how it arrives at its costs. When both consumers and clients know where money goes in lumber processing, they can connect themselves to others involved in creating VFF products and feel confident that they are involved in a trustworthy cause.

Finally, demonstration projects, like LaForce Hall, should continue to be used to highlight the strengths of Vermont Family Forests. The beautiful finished product, the satisfied clients, and VFF's ability to work with consumers to provide for their needs while also educating them about the product are all likely to give potential consumers and clients a positive impression of the value and viability of the Vermont Family Forests model of forestry.

Aldo Leopold and Vermont Family Forests

"The practice of conservation must spring from a conviction of what is ethically and esthetically right, as well as what is economically expedient."
-Aldo Leopold

Aldo Leopold encourages people to enhance their relationship with their environment, to develop a land ethic and sense of place, and to understand the ecological intricacies of the habitats that surround them. His influence regarding conservation and sustainability has fostered the cultivation of organizations such as Vermont Family Forests (VFF) to focus on sustainable forestry. Valuing the ecological, economic, and social well being of the entire environment, VFF seems to represent and embody Leopold's dominant ideas. Just as Leopold's ultimate aim was to achieve a healthy land and a healthy community, VFF integrates community members in ways that foster relationships among one another and among their ecological surroundings. Examining the mission, processes, and goals of this Vermont initiative, and the LaForce project in particular, we can further develop the crucial relationship and harmony with the land, as well as further understand, embrace, and implement Leopold's philosophy and values into our own decisions.

Background: LaForce Hall and Vermont Family Forests Lumber

"A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

-Aldo Leopold

The Decision to Use Vermont Family Forests Wood

The building of LaForce Hall.

Innovation and open-minded thinking are goals of any college education, but the commitment to progressive ideas and the foresight to take risks by a higher education administration are rare. When Middlebury College decided to collaborate with Vermont Family Forests in the building of LaForce Hall, it demonstrated its ability to widen its perspective by continuing to support this new sustainable forestry initiative. With the already demonstrated goal of using sustainable wood as exemplified by the Bicentennial Hall project and a strong relationship with Vermont Family Forests, the two parties were able to convince the begrudging architects of the benefits of using local character wood, with knots and other irregularities that do not lessen the quality of the wood, as opposed to clear cherry for the high visibility ceiling and wall paneling. At the roundtable meeting that included Dave Ginevan, Executive Director of Facilities Planning for Middlebury College, project managers Barr and Barr, an architect from the firm of Tai Soo Kim, and VFF representatives, the College held firm to its criteria of using local sustainable wood, while VFF was able to provide samples of the wood and explain its benefits to the community and the environment. The support of VFF by the College and project managers was grounded in the experiences they had with the Bicentennial Hall project. It is important to look at the decision making process from the beginning of VFF's involvement with the College in order to better understand the development of their relationship.

Middlebury's commitment to environmental awareness is evident in its stated "environmental peak of excellence," but what really matters are the opinions and priorities of those involved in the process who have the power to influence the College's practices. From the beginning of the move to use sustainable wood, the planners had the overwhelming support from the trustees who gave clear directives that Facilities Planning was to explore these more environmentally friendly options. However, Dave Ginevan makes it clear that it is the priority of Facilities Planning to "do what is best for the College." In his mind, whether the motivations are economic or environmental, efficient and sustainable use of resources is something that just makes sense, and this sensibility is behind every project Middlebury College undertakes. Nan Jenks-Jay, Director of Environmental Affairs and Planning, has a slightly different opinion and views the use of local sustainable wood as a progressive endeavor. In any case, the unified support by the administration, trustees, and planners at the College assured that there would be no factions hindering the process of using local sustainable wood.

When stipulating it wanted green certified local wood for the building of Bicentennial Hall, Middlebury College took a risk on a new industry and opened up the dialogue between the College and community for a number of different possibilities. At that time, Vermont Family Forests was the only viable option for obtaining the kind of wood the College wanted. VFF was able to educate the College about appreciating character wood and using the whole tree instead of just the wood that was clear of character marks. When it came time to find wood for the LaForce Project, the College relied on its past positive experience with VFF. As the market continues to expand and the number of competitors increases, VFF is not the only provider of local green certified wood. When planning the new library at Middlebury College, Dave Ginevan was able not just to think about environmental benefits from sustainable forestry, but the increase in competitors allowed him to also consider the economics of the industry. Employing a diverse array of community members arguably has the most benefit to the local community and economy. With the

Installation of VFF wood into LaForce Hall.

expansion of the market, the College and other potential buyers of sustainable wood will have the flexibility in choosing their providers, enabling them to spread their money around the community.

As we acknowledge the benefits of using local products and Middlebury's decision to work with VFF, this report describes the outcome of the LaForce Hall project as well as the potential outcome had the building planners decided to use clear cherry, as recommended by the architect. The result of Middlebury's decision had cultural, economic, and ecological ramifications that are worth recognizing, analyzing, and comparing to consequences of using clear cherry. This report assumes that the clear cherry would have come from Pennsylvania, the heart of commercial cherry production in the United States. Examining the community interactions and relationships involved in the decision, as well as peoples' feelings towards the project and working with VFF, we gain a further understanding of the value of using local products. The economic analysis of using VFF yellow birch and beech and Pennsylvania black cherry provides a specific comparison between the options that is useful in analyzing assumptions and highlighting particular areas of expense. Finally, the ecological aspect of this report examines the effects on the forest habitat in both locations. Presenting a case study of the LaForce project and outlining the effects of timber harvesting on both the potential and actual decisions establishes a greater understanding of the effectiveness of VFF, and provides an analysis that may assist in improving VFF as it further establishes itself within the sustainable forestry market.

Why Is Local Good?

Integral to Vermont Family Forests' mission is the assumption that using local resources is beneficial not only to the land, but to the community as well. While sustainable forestry is commendable since it lessens the impact on the environment, using local products keeps the benefits closely tied to the region in which the resources are extracted. The use of local resources, rather than consuming items that come from beyond the proximate area, has undeniable environmental, economic, and social benefits.

For a community to be sustainable it must have a healthy relationship with the land and must therefore ensure that the resources it uses are harvested and extracted properly. People inherently care more for the land to which they have a connection. Whether it is because it is the forest that is the playground for school children or they enjoy walks by the river that runs through the town, they will feel a heightened sense of responsibility for the land if they are a part of it. People are then motivated to protect the land that they are connected to and are more likely to implement sustainable practices. As residents distance themselves from the production of goods consumed in their community, the urban-industrial economy replaces the local economy and care for the land and its people often decline. We contend that the best way to consume responsibly is to be educated about where goods are coming from and how they are produced. The easiest way to accomplish this is through buying local.

The extraction and use of natural resources have obvious economic benefits to those who are directly connected to the processes of extraction and trade. In the forest products industry, this includes many individuals and businesses – landowners, loggers, truckers, foresters, mill and kiln workers, and wood products manufacturers. However, it is important to acknowledge that these economic benefits also have the potential to greatly benefit the greater community when they are produced and sold locally. Local production and consumption creates a more closed circle within the community through which money and other assets can circulate more benefits to greater numbers of local people.

While the social benefits of consuming locally produced goods may be the most difficult to quantify, they are just as important as the environmental and economic benefits. Essential to the vitality and quality of any community is the existence of a sense of responsibility to the people and land that make it the place that it is. When the community consists of wise consumers, they have the power to determine the kind of place they live in. These consumers can shape their landscape, curbing suburban sprawl, and effectively maintain a working landscape that is beneficial to both people and land. Community members must work to help one another through good social acts and economic choices that will benefit their neighbors and local economy. Good communities are aware of their resources and production capabilities, and seek to be as sustainable as possible. By considering the needs of locals first, the majority of the benefits from extracting the resources go directly back into the community. This attention to one's own sense of place helps ensure good economic outcomes and build upon a sense of unity.

As more and more goods are produced and consumed locally, individuals within the community become more aware of who is doing the producing. They reinforce existing connections and forge new connections within the community and support their neighbors, not only affecting consumption practices, but also enhancing inter-personal relations throughout the community. This strengthening of relations between neighbors has undeniable social benefits in other important realms such as education and politics.

The Vermont Family Forests Model of Sustainable Forestry

The central focus of Vermont Family Forests is to foster a unique forestry method that enhances economic benefits to the landowner, thus creating the opportunity for more economically and ecologically sustainable stewardship of the land. VFF seeks to cultivate three important principles that lead to better working landscapes: well-informed stewards, sound economic returns for ecological forestry, and a community-shared land ethic. Community based forestry increases the economic value of the land to the landowner and disperses the benefits throughout the local area. Incorporating local trucking, sawing, and milling adds benefit on a larger scale. VFF reworks the “value adding process” into its model to maximize profits throughout the entire production process. By careful monitoring of the chain of custody, VFF is able to capture most of the added benefit within the community. Another crucial aspect of the VFF model is green certification. While certification is an initial expense to the landowner, it will hopefully yield more long-term ecological and economic benefits through sustainable stewardship. These guidelines have been adopted and expanded upon by VFF in order to accomplish all of its goals for sustainable management practices from “stump to shelf.”[1]

Traditional management practices yield around $25 per acre per year when standing trees are harvested and sold in more traditional markets, a value that can hardly recoup the costs of management or, more importantly, taxes.[2] VFF pays landowners twice the average market stumpage rate, increasing the return to landowners for well-managed lands. It pays loggers approximately 1.6 times the going rate for exceptional logging practices. Increasing pay creates an incentive to manage land in a sustainable manner. By creating community forestry operations as a winning proposition, landowners are encouraged to retain their forestland. However, this becomes increasingly difficult as the initial economic benefit of selling the property may be a higher priority than the ecological benefits of practicing sustainable forestry amidst Vermont's growing population.

Another aspect of VFF that sets its forestry practices apart from others is its reversed approach to the market. Ordinarily, markets force landowners and timber harvesters to high-grade – only cutting the best trees to capture the highest prices. This is not an ecologically sustainable practice. Instead, VFF is working to develop a database of standing trees that are available for harvest. This will give consumers a clear picture of what products can come out of the forests without reducing the stand quality. Depending on the consumer's selections, VFF will then be able to create its own market before the trees are cut. This eliminates storage and potential spoiling of lumber. The trees come straight from the forests to the mills and directly on to the consumer. Landowners are encouraged to use local wood products manufacturers to limit trucking costs and increase business in the local community.

The VFF model seeks to increase the value of timber and create added incentives for sustainable practices. Through value adding to the logger and landowner as well as utilization of local infrastructure, VFF has created a smaller circle of operations. This model retains the maximum economic benefit to the area. Forests are then managed in a healthier condition than they might otherwise have been due to high costs of ownership.

LaForce Hall: A Community Project

The strength of cultural and community relations and effects of using local wood sustains much of VFF. Through the numerous steps and jobs involved within the forest products industry, the decision to use VFF yellow birch and beech created beneficial opportunities for many Vermont community members. Landowners, loggers, and truckers, as well as those working with sawing, kiln drying, and millwork, establish community dynamics in which cooperation, flexibility, and communication are essential for the success of any project. The Bread Loaf lands owned by Middlebury College and land owned by Jake and Holly Callery (Starksboro, VT), Hardscrabble Associates (Bristol, VT), Tom and Wistar Rawls (Bristol, VT), and Ron and Karen McEachen provided yellow birch and beech lumber for the LaForce project. John Anderson (Ripton, VT), Richard Lavigne (Milton, VT), and Bill Torrey (Jericho, VT) logged the lumber, which was trucked by numerous people and companies including Hal Saunders (Monkton, VT), Paul Fournier (Hinesburg, VT), Weston Pulpwood Sales (Essex

Junction, VT), Bob Growney (Shoreham, VT), Joe Gagnon (Pittsford, VT), and Woodswork (Lincoln, VT). The sawing aspect of the LaForce project was completed by Mark Palmer (St. Albans, VT), South Mountain Sawyers (Bristol, VT), Bob Growney (Shoreham, VT), Joe Gagnon (Pittsford, VT), and Woodswork (Lincoln, VT). Caledonia Kiln (St. Johnsbury, VT), S.A.W. Mill (Morrisville, VT), and Belgian Woodworks (Starksboro, VT), as well as Woodswork (Lincoln, VT), were involved in the kiln drying of the birch and beech. Finally, the millwork was done by Tioli Woodworking (Middlebury, VT) and Brian Sutton (Chrysostome, Quebec). As these names reveal, many people are involved in a project such as LaForce, and the focus on local products may reinforce the use of local community members, encourage involvement, and instill a connection to the land and resources available.

Community Involvement and Vermont Family Forests

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect."
-Aldo Leopold

Vermont exhibits a tradition of environmental consciousness and leadership within its communities, governments, and institutions. It is the most rural state in the country; the largest city of Burlington is fewer than 40,000 and it finds itself among small, rural communities within the dominant farmlands and forestlands of the state. Although farming and forestry make up only 1.3% of Vermont employees, the farming and forestry sectors play a crucial role in the character of the state and provide the backdrop for Vermont's highly profitable tourism industry. While the natural environment contributes to recreational opportunities for Vermont residents and visitors, the forest products industry also contributes to the community by allowing organizations such as VFF to utilize resources in a sustainable manner. Furthermore, with 77% of Vermont forests privately owned, it is crucial to instill sustainable management practices in order to preserve Vermont's culture and sense of place. With a forest products industry in transition, efforts that focus on utilizing local infrastructure may enhance local economic activity and community benefits. As VFF involves a variety of sectors and aspects of sustainable forestry through its organization, it seems to truly value the state's natural resources, represent the state's small-scale ideals, and promote the state's focus on local interaction and relations. As those involved with VFF continue this community and environmentally conscious process, it is beneficial to further examine the reasons for participation with an organization like VFF and the process and progress of using this sustainable wood.

There have been many individuals and groups involved with VFF since its beginning. Their reasons for involvement in and impressions of VFF are essential to assessing VFF's ability for continued growth within the sustainable forestry industry. We conducted a diverse array of interviews in order to understand motivations for involvement with VFF and to garner suggestions for improvement. A standard questionnaire (Appendix 1) was used with the flexibility for more informal conversation. Aside from the LaForce project, past clients of VFF include the Starksboro Library, the Lake Champlain Maritime Museum, Shelburne Museum, and Beeken Parsons Furniture. In addition, if VFF has the goal of becoming a more viable force in the market, the views of clients, such as Bread Loaf Corporation, are also important. These interviews provide a sense of the community's support of VFF and the degree of its future potential for expansion in the market.

LaForce: Interviews with Project Stakeholders

Bob Tenzer prepping birch logs for debarking at Gagnon's sawmill.

When the average consumer buys wood at the local lumber store, he or she does not realize the number of people and resources involved in getting that wood to the store. In assuring sustainable forestry practices, VFF is committed to considering all aspects of the forest products process, including the landowner, forester, logger, and those involved in kiln drying, millwork, sawing, and trucking. All of these individuals and companies have many other clients who may or may not have such strong land ethics, and their reasons for working with VFF provide insight into the kinds of people who support the sustainable forestry industry.

In looking at the individuals involved through VFF with the LaForce project, apart from Middlebury College, there are a number of general themes that emerge throughout their responses. They all had very positive reactions to the process and believe that it is fundamentally a result of the good relations VFF works to cultivate. The majority also have a personally cultivated environmental awareness that lends itself to collaboration with VFF. Important to landowner Tom Rawls is VFF's goal to pull the forestry community of Vermont together so that resources, similar interests, and talent can be combined and to prevent the disintegration and fracturing of the forest landscape. Because of his close connection to the landscape through his work, the preservation of resources is extremely relevant to him. So when VFF's director David Brynn approached him about using his wood for LaForce, he readily agreed. Aside from updating his wood troughs and management plan, Rawls did not have to do much in order to meet the green certification standards. This is exemplary of his personal commitment to sustainable forestry and a land ethic. He believes that while he appreciates Vermont's northern hardwood forests, the majority of the other landowners have very mixed opinions on sustainable forestry. While Rawls takes full advantage of VFF's educational workshops, it is mostly due to his personal environmental ethic.

Rupert Johnston guiding the workhorses during the horse-logging of the Callery woodlot.

Similarly, logging contractor John Anderson, who became familiar with David Brynn through the Bicentennial Hall project, spoke enthusiastically about VFF and his role in the LaForce project. His low-impact logging technique of using horses instead of skidders and trucks to reduce damage to the land is fairly unique in Vermont. Other horse loggers in the area are mostly recreational, with only two other commercial horse loggers in the state. It is sensible that Anderson would be involved with VFF because of its similar environmental ethics and commitments to using resources in a sustainable manner. Anderson expressed that there is increased demand for his type of low-impact logging as people become more aware of skidder damage, the increased price of land, and an overall increasing respect for the land. The constant demand for his services suggests that there is an increase in the number of individuals and firms interested in using sustainable wood.

For the LaForce project, horse logging was not only more beneficial for the forests, but the logging done on Middlebury College land at Bread Loaf also benefited community members. Adjoining the Green Mountain National Forest, Bread Loaf's Rikert Ski Touring Center offers an opportunity for both recreation and resource management. Lumber for LaForce came from Bread Loaf lands, and working with VFF allowed an opportunity for the area to be enhanced as recreational land. Personal interactions and the continuous communication between Steve Weber, Middlebury College forester, and Bread Loaf Assistant Superintendent John Rubright, led to a relationship that fostered a collaboration of efforts and a greater appreciation of the land. Working together, Weber and Rubright discussed a plan of how the cross-country trails (all developed from existing logging roads) could be altered to better suit the forestry work and the recreating community. The Frost Trail at Bread Loaf adjoins one of the areas logged and it was previously difficult to groom and maintain. However, because of the collaborative efforts, the trail is now a flat, wider path with a gentle slope. Ditches were put along the trail to help with drainage and decrease the amount of puddles often occurring on the trail. Since these alterations were made, the Frost Trail is increasingly popular among those skiing at Rikert and is enjoyed by many during the winter months. The cutting of the trees occurred in August 2001, and using a single chainsaw and few trucks, logger Bill Torrey caused little disturbance to the people that use this area. Additionally, these forestry practices mimic the natural disturbance regime with suitable gaps and remaining debris, leaving the forests of the area appearing natural and full. Utilizing VFF wood and services provided an opportunity to balance community benefits, further personal interaction, and enhance the Bread Loaf landscape in ways that may be enjoyed by the whole community.

Those involved in the LaForce project through VFF had a unique relationship with it and past personal relations with director David Brynn. Their life-long commitment to more environmentally friendly practices fits the goals of VFF, but the growth of the local sustainable forestry market means that VFF cannot rely solely on environmental awareness for its customers and must broaden its appeal economically in order to remain competitive.

Interviews with Past Clients

Central ideas and beliefs among past clients of VFF enable this commitment to sustainable forestry. With David Brynn as Addison County forester and an active member of the forestry community, his relations have established community bonds that cultivate trust and working together. Allen Noble of the Starksboro Forest Board was encouraged to work with Brynn on the Starksboro Library as the Forest Board’s management decisions called for green certified wood. Satisfying the townspeople’s desires for sound forest management, VFF’s sustainable practices created a sense of responsible action and community effort. Similarly, Nick

Patch of the Lake Champlain Maritime Museum said his relationship with Brynn allows a sense of collaboration and teamwork. Patch has used VFF for the past three years on various projects, such as building rowing gigs and a schooner. He feels working with VFF allows greater accessibility and availability to answer questions. In this way, Patch finds VFF "on your team"—often unlike working with commercial loggers and sawmills. Furthermore, field trips to the forest site create an intimacy with the project's progression and cultivate a greater sense of connection to both the forest and those working on the project. Whether among landowner and logger, contractor and architect, client and student, the close relationships developed by working with VFF seem to create a sense of trust, transparency, and quality guaranteed through small business and personal interaction.

An environmental consciousness and concern for the health of the forest was also highlighted by those involved with VFF. The Starksboro Forest Board finds VFF's mission in alignment with their own desires and those of the people of Starksboro. With a long family history of living in Addison County, Noble's land ethic seeks a balance between management and recreation. As a forester and dairy farmer, Noble's deep attachment and appreciation for the land and its resources fosters an awareness of his actions and decisions. Similarly, Patch tries to integrate his own ethical beliefs into his business at Lake Champlain Maritime Museum by working with VFF. Ted Ingraham, a carpenter who has used VFF wood for his historic renovation projects, has a respect for nature and believes in harvesting to preserve the forest, and so he chooses to use VFF wood. In this way, VFF creates an opportunity to incorporate personal values and ethics within business. Running their business as an extension of themselves and their own beliefs, furniture-makers Bruce Beeken and Jeff Parsons satisfy their commitment to environmental integrity by using sustainably harvested wood. Beeken and Parsons find comfort in associating their company with materials and customers that have a similar personal commitment to long-term thinking, and participate in taking care of the local environment. Incorporating an environmental ethic beyond one's personal values is achieved by using VFF wood—sustainable practices and the health and well being of the forest are seemingly assured when clients choose to use VFF.

As a small, focused organization, VFF has the ability to satisfy particular demands and requests of its clients. When working with VFF, clients reported satisfaction and high quality. Valuing both the product and education, Patch sought a responsible source of lumber for his schooner and rigs, yet also wanted to integrate the process into an education program. VFF was able to harvest a small amount of high quality lumber, satisfying specific needs, as well as offering an opportunity to educate community members. Similarly, Ingraham's work with the traditional barn at the Shelburne Museum required rough pine lumber that cannot be found at most lumberyards. The small quantity and the rough lumber needed for the historic renovation projects were met by VFF. As these projects reveal, VFF can satisfy a small niche of specific needs that cannot always be met by larger corporations and organizations.

Further Developing Vermont Family Forests

As sustainably harvested wood is becoming increasingly desirable and available, it is even more important to evaluate the role of VFF in order to enhance its position in the market. Bread Loaf Corporation in Middlebury, VT has wanted to expand the green building side of its business, and is focusing on educating the people within the business as well as its clients. As a conservative business in that it does not take on projects it cannot handle, Bread Loaf Corporation is also progressive in that its focus is on expanding green building. Talking with Architectural Designer/Environmental Specialist Linda Samter of Bread Loaf Corporation, it appears the sustainable forest industry is increasing; yet in order to use VFF, the process must become more "user-friendly." Making decisions internally with few interactions among unknown organizations and corporations is appealing to both businesses and clients, yet it is not always easy to do. Lack of availability and supply along with high economic cost were the echoed concerns of both past and potential clients. Expanding VFF to include more landowners and a greater variety and availability of wood will increase the supply and feasibility of expansion, as well as increase its clientele. Hopefully, VFF will improve its ability to be "user-friendly" through an inventory database displaying lumber available, as well as a more efficient system that meets warehousing needs (e.g., more dry kilns within the state) and eases accessibility.

Time and again, the interviewees emphasized the need for education—for all those involved. As a primary focus of VFF, education is crucial to all aspects of the project, whether for the landowner, the logger, the architect, the contractor, or the client. VFF has been successful in telling its story of sustainability, yet it is necessary to further advance this story in order to maintain and continue the organization's progress and success. VFF must find a means to be economically feasible in order to remain competitive with other green certified wood. However, with a growing market and additional options and choices for those involved in choosing lumber, it will be increasingly important for VFF to distinguish itself among others in the sustainable forestry industry and strongly portray its dedication to healthy Vermont forests and vibrant communities. Additionally, while the College's enthusiasm for using VFF and supporting the sustainable wood industry is undeniable, had it decided to adhere to the architect's requests and use clear cherry, the end result would have been much different.

A Potential Pennsylvania Community

In determining the ramifications of using VFF wood in the LaForce project, it is useful to look at the community that might have been affected had the decision been made to use the originally proposed clear cherry wood. While it has already been argued that using local resources is beneficial to all people involved in the process, there are considerable impacts that the decision had on a potential community in Pennsylvania where such wood would most likely have originated. It is difficult to sketch a portrait of a community in Pennsylvania based on the assumption that it is the place the decision would have had an impact on, but there are some helpful general observations and conclusions.

Pennsylvania is a state diverse in its economy, population, and geography. It is dominated by the two urban centers of Pittsburgh and Philadelphia. Yet while the forest products industry may play a minor role statewide, it assumes a much greater role in the heavily forested north central Pennsylvania region. The Allegheny National Forest, with 3% of the state's forestland ownership, is at the heart of the most concentrated region of forestry activity and a probable area for logging of the cherry wood. The Allegheny National Forest, established in 1923, covers approximately 513,257 acres. While the four counties in which the Allegheny National Forest is located are diverse in industry and occupation, they are representative for understanding the relationship between the forest products industry and community members. For example, in 2000, for Pennsylvania as a whole, agriculture, forestry, and mining constituted only 1.3% of industry, while the average for the four counties was 3.0% and therefore represents a better picture of the industry where it is most prominent.

The fact that private landowners own 71% of the land in Pennsylvania is important in understanding the people's connection to the land and the potential impact this may have on the environment. In considering the impact of Middlebury College's decision to use VFF wood, it is important to weigh the negative impacts of not using Pennsylvania cherry on the Pennsylvania community with the benefits of using VFF wood for the Vermont community. For instance, the county in Pennsylvania with the highest percentage involved in the forest products industry, Forest County, also has the lowest percentage of people in the labor force, the lowest median income, and the highest percentage of families below the poverty line of any county in the entire state of Pennsylvania. For this county in particular, highly sensitive to the forest products industry, the decision not to use clear cherry may have had negative impacts on the community. However, as VFF proposes to benefit the communities of Vermont, perhaps such an organization can provide an example to other communities encouraging similar local efforts that enhance and improve economic and social benefits in Pennsylvania counties.

Conclusion

The decision to use Vermont Family Forests wood for Middlebury College's LaForce project was a decision to support the local community and its forest products industry. By using VFF wood, the College continued to adhere to its sense of a land ethic – similar to VFF's. The connections and personal relationships VFF cultivates with the array of individuals involved in the process of logging and preparing the wood is a testament to its commitment to the local community and economy. From interviewing past VFF clients, we conclude that these clients already have an established sense of environmental responsibility. Furthermore, VFF highlights trust among those involved in the projects, transparency of the process and workings of the projects, and quality of lumber for the projects. If VFF wants to expand its market, it needs to be able to promote that sense of value throughout the community, as it clearly has begun to do by fostering personal relationships with individuals within the community. The clear challenge is that with the increase of firms in the sustainable forestry industry, VFF must insure that its prices and product availability remain competitive.

Green Certification

"Forest conservation depends in part on intelligent consumption, as well as intelligent production of lumber."
-Aldo Leopold

The decision to use green certified wood not only impacted the community, it impacted the ecology of the forest as well. The College hired Vermont Family Forests to run the project using green certified wood both from the College's forest and from some VFF landowners. The following is a discussion of the process of green certification, the merits of using green certified wood, and some criticisms of green certification.

In order for wood to obtain green certified status it must meet a series of regulations and inspections imposed and performed by an independent third party. These regulations adhere to standards established by either the Forest Stewardship Council (FSC) or Sustainable Forestry Initiative (SFI). For purpose of comparison, we will look at the FSC certified VFF lands used in the project and the FSC certified Pennsylvania state forests as a potential source for certified cherry for the project. The certifications performed in both Vermont and Pennsylvania used the standards established by the FSC. These standards are intended to promote environmentally appropriate, socially beneficial, and economically viable management of forests around the world. In addition, the regulations vary from region to region based on local ecology and terrain. Some organizations such as VFF impose extra standards beyond the FSC standards. Green certification can extend beyond forest management to the actual processing of the wood, known as "chain of custody." This includes such aspects as wood treatment at the mills and kilns. Determined by the company, the guidelines for green certification chain of custody can vary depending on the certifier. SmartWood certifies VFF, while Pennsylvania state forests are certified by Scientific Certification Systems (SCS). Both of these green certifiers exist as independent third parties and adhere to a similar process to issue green certification. [3]

In order to gain green certification from SmartWood, the landowner or company must achieve a specific set of criteria. A team reviews the property using either generic guidelines or bio-regional/country standards drafted with the help of local experts and organizations, often with assistance from the FSC (Appendix 2). For their evaluation of VFF lands they used the

Northeast SmartWood guidelines for assessing natural forest management.[4] The team of certifiers centers its examination on five main principles:

1. Long-term forest security;
2. Maintenance of environmental functions such as watersheds and conservation biology;
3. Sustained forestry yield;
4. Positive impact on the local community; and
5. A long-term management plan.

The landowner or company must earn a score of 80 or above in the categories in order to receive certification. Different levels of certification exist depending upon the scores attained by the landowner. The highest level of green certification awarded by SmartWood is "well managed" and the lowest level is "sustainable."[5]

In addition to green certification of forest management, SmartWood also certifies the chain of custody. The guidelines required for chain of custody certification track the wood through the various steps of processing. These standards vary based on what is being done with the wood, but three common requirements exist:

1. The wood must be stored in a separate place;
2. It must be marked clearly; and
3. Records of actions and transactions must be kept.

Chain of custody certification performed by SmartWood lasts for five years and involves yearly audits. The different levels are "exclusive," for a company that only sells FSC certified materials, and "non-exclusive" for the companies that sell products that are not all certified by FSC certifiers.[6]

The SmartWood report summarizing the green certification of VFF lands discusses the certification process and what followed after VFF earned green certification. On July 15, 1998, VFF began an almost one year process involving a field assessment performed by three people and a peer review of the assessment report. The evaluation and assessment of VFF's forests centered on long-term forest productivity, quality of harvesting, environmental impacts, optimal forest potential, effects on local communities, and economic viability. VFF gained a certification of "well managed" and had twelve conditions or points that needed to be improved upon. Yearly audits followed the original certification (all of which VFF passed) and VFF received positive comments for the management of its forests.[7]

In addition to satisfying the requirements of SmartWood's green certification, VFF also implements its own standards stricter than SmartWood's. These standards focus on a management plan, natural community maps, boundary marking, and access roads.

An access road used for VFF logging for the LaForce Project.

They also present landowners with a voluntary forest management checklist to promote sustainability.[8] VFF has taken green certification to a higher level, beneficial to both the ecology of the forests and the communities that care for them.

Although green certification is intended to benefit the environment and the local community, this goal is not always accomplished. Scientists have begun to investigate and research the value and meaning of green certification, focusing on whether or not it is worth it. Mitch Lansky, for instance, has critiqued the management of J.D. Irving forestland in Maine that had obtained FSC green certification by SCS.

Lansky argues that certification is often awarded on the basis of future changes in practice and policy as opposed to the current conditions of the forest.[9] Despite the fact that serious over cutting resulted in a "depleted stock to sub optimal levels and threatened the future sustainability [of the forest]," Lansky writes that green certification was still renewed by SCS. In addition, J.D. Irving sprayed 1,600-6,000 acres with herbicides despite the fact that some of the chemicals had been banned by the FSC. Lansky also points out that Irving hired Mexican nationals to work on the land, which minimizes the role of the community in the management of the forest and as a result does not keep wages in the community. The Canadian Sierra Club even filed a protest against the certification of the forest, but it was rejected due to lateness. Lansky's main argument centers on the fact that by certifying this particular forest in Maine, the whole process of green certification looses credibility and is essentially undermined. He raises issues over whether or not green certification is worth it, and that it might not be as environmentally friendly as it appears on paper.

Some people in Vermont are not happy with certification processes and what certified wood has brought them, though for other reasons. The Vermont Loggers Association went through extra training to gain certification from the SFI. However, its members have seen no benefits yet and lost money as a result of the training fees.[10] Stories like these hurt the reputation of green certified wood and result in people questioning the system.

Based on the summary report issued by SmartWood regarding the certification of VFF lands, it is evident that some corners were cut there as well. The land was originally certified despite the fact that the team of certifiers could not examine the soils and erosion patterns due to snow cover. In addition, during the initial certification, the group of certifiers only visited ten of the thirty-one areas applying for green certification with fewer parcels examined under subsequent visits.[11] Similar to the land owned by Irving in Maine, certification was issued under conditions for future changes. That being said, VFF does have additional standards to increase forest sustainability and thus minimize the environmental impact on the land. While green certification is not a panacea for the forest products industry, VFF appears to be a leading advocate and innovator in sustainable forestry. It should continue to lead and work to address the problems with the current state of green certification.

LaForce Hall: Economic Factors and Implications for Vermont Family Forests

"Healthy land is the only permanently profitable land."

-Aldo Leopold

The Economics of Green Certification

Millwork conducted by Bob Growney in Shoreham, VT under VFF certification standards.

The economics of green certification, much like its ecological merit, remains a hotly debated issue. The variety of certification systems on the market (namely SFI and FSC) reflects the ambiguity in green certification of lumber. Thus, consumers may not have a clear idea of what, exactly, they are buying when they invest in green lumber. Related to this point, foresters, wholesalers, and lumber companies wonder if consumers are willing to pay a premium for green certified lumber to offset the costs of certification and management. The growth of the organic foods industry suggests that at least some consumers regularly pay higher prices for products because of the organic label. However, it is likely that consumers' willingness to pay more for organic foods is heavily influenced by the perceived health benefits of organic food versus non-organic food. For a product like lumber, which is purchased rarely by most consumers, the desire to seek a green certified product is not likely to be influenced heavily by a direct personal benefit, nor is there such a direct health connection as with organic food. Furthermore, much of the wood we consume is “hidden” from us in manufactured products (e.g., furniture). Our personal connection to wood products is thus weakened simply by the nature of how we use the resource. Therefore, it is safe to assume that the premium consumers are willing to pay for green certified lumber ought to be lower than for something as directly personal as the food they eat. Also, since lumber purchases are rare for most people, consumers are likely to be less informed about green certification and may therefore fail to demand it. With these issues in mind, groups like VFF have their work cut out for them.

Nevertheless, studies have shown that consumers do report at least some willingness to pay a premium for green certified lumber products. A recent study of a nationally representative group revealed that 89% of respondents said they were willing to pay more for green building materials. However, the study did not address green certified lumber directly and respondents did not place it among their highest priorities for green building practices. The study also showed that construction companies consistently underestimated consumers’ willingness to pay for such products. Furthermore, 95% of builders said that high cost was the most limiting factor in green construction. If builders underestimate consumers’ willingness to pay for green products, they are less likely to educate consumers about them or advocate for their usage.[12]

Other studies have shown that manufacturers exhibit a lower willingness to pay a premium for green certified lumber than average consumers. Most consumers report that they are willing to pay a 5% premium for green certified lumber.[13] However, only 60% of secondary lumber manufacturers and 22% of primary lumber manufacturers said they were willing to pay a 5% premium for green certified lumber.[14] In the green certification industry, the Forest Stewardship Council (the certification system that VFF uses), regarded as a more eco-friendly program than SFI, has been losing clients and not generating as many new ones as it would like. The downward trend appears to be related to cost. A senior FSC employee stated, “The sobering fact is that our clients’ willingness to pay is anything but robust – it’s weak and getting weaker.”[15]

The cool reception to premiums on green certified lumber by the forest product industry means that consumers may face supply shortages because those who use lumber most frequently are less likely to demand green certified products. If manufacturers are unwilling to pay more for green certification, consumers will have their options for green certified lumber and green certified lumber products limited. Therefore, it appears that the biggest challenge for the green certified lumber industry lies in consumer education. Only well-educated consumers will actively demand green certified forest products and be willing to pay a premium for them. Educating consumers may be extremely difficult given that lumber purchases are a rare event for most people. It is interesting to note that the consumer in our study, Middlebury College, is often involved in large construction projects that require large amounts of lumber but in which lumber is a minor cost of the total project. For smaller projects (e.g., a house) the cost of lumber may play a larger role in determining the total cost of construction. Middlebury also has an extremely well educated group of people advocating for the purchase of green lumber and has exhibited a willingness to pay for green lumber and other "green" products as evidenced in the construction of Bicentennial Hall. Thus it may not represent a "typical" consumer in the sense that the level of education about green certification is abnormally high amongst many decision makers at the College, and its desire to act by buying green products is widely seen as a model for institutions and individuals alike. On the other hand, rather than typical consumers, it may be just those individuals who already tend to act upon a land ethic or similar conviction that VFF can target with its products and educational efforts.

So did Middlebury incur an added cost in choosing to use VFF lumber to build LaForce Hall? Did VFF's sustainable forestry model produce a price for LaForce's lumber that was drastically different than if Middlebury had chosen to accept the architect's request for cherry? As it turns out, the costs were very different between the two options. What may be surprising is that buying green certified birch and beech through VFF actually saved Middlebury College money and also allowed it to support local business and landowners while helping to give VFF a better idea of how it can improve upon its vision of sustainable forestry.

VFF versus Pennsylvania Cherry: A Cost Analysis

We compared the costs of LaForce Hall as they were reported by VFF with a hypothetical cost range for Pennsylvania black cherry.[16] The VFF numbers represent real values and were broken down by VFF to reflect the costs at each stage. Using VFF's breakdown schemata, we attempted to estimate the various costs had non-certified clear cherry been used in LaForce (Table 1).[17]

Table 1: Cost comparison of VFF birch and beech versus Pennsylvania Cherry.

Expenses	**VFF**	**PA cherry (low)**	**PA cherry (high)**	**PA cherry (Mean)**
stumpage	$5,139	$44,827	$69,764	$44,827
logging	$15,106	$2,603	$5,205	$3,904
trucking	$6,407	$4,430	$7,141	$5,785
sawing	$13,811	$10,410	$17,731	$14,071
milling	$1,127	$1,127	$1,127	$1,127
drying	$6,739	$4,981	$5,977	$5,479
subtotal	$48,329	$68,378	$106,945	$75,193
Gross Profit (40% subtotal)	$19,332	$27,351	$42,778	$30,077
Total	**$67,661**	**$95,729**	**$149,723**	**$105,270**

See Appendix 3 for a description of how estimates of costs were generated.

For the estimate of the Pennsylvania cherry, a range of costs were generated for various stages of production using a combination of VFF's own estimates of costs per board foot, forest products industry contacts, and online data about stumpage rates for northwestern Pennsylvania. The estimated costs per board foot for each stage of the process were then multiplied by the total board feet reported for that stage by VFF. For example, approximately 43,000 board feet were sawed for LaForce, but only approximately 33,000 board feet were kiln dried. Milling costs were presumed to be the same for both VFF and the Pennsylvania cherry since it is likely the milling would have taken place locally upon delivery for the cherry. Finally, with the help of VFF employees, we determined that a lumber distributor like VFF would need to charge about 40% above cost (subtotal) in order to be a profitable enterprise. VFF did not charge this much in the LaForce project because it operates as a non-profit organization. We chose to use the 40% gross profit figure to better reflect how VFF would perform were it to enter the marketplace as a for-profit business and thus make comparisons more realistic.

Table 1 suggests that the VFF option was much cheaper – less than half price compared to the high end of the range for cherry. However, most of the savings were a result of lower stumpage rates for beech and yellow birch versus black cherry. Two separate sites were cut specifically for the LaForce project to produce the lumber. One cut was on Middlebury College's own land in Ripton (31,765 board feet) and the other was from the Callery's stand (11,611 board feet) in Starksboro. At both sites, VFF estimates that it came close to achieving its goal of paying the landowner double the prevailing stumpage rate.[18] Despite paying almost double the stumpage rate, VFF's total stumpage expenses were from 9-13 times less than for black cherry. This is not surprising considering the fact that black cherry is currently an extremely valuable species, while yellow birch and especially beech represent some of the least expensive hardwoods on the market.

Unlike stumpage expenses, the logging rates for VFF were significantly higher than for the Pennsylvania estimate. Part of this difference comes from VFF's stated goal of paying loggers 1.6 times the normal rate for logging to encourage good logging practices. At both sites, VFF estimates that it achieved its goal of paying loggers 1.6 times the normal rate for logging. There may be other factors affecting the large observed difference in logging fees. Since VFF practices a selective form of logging, leaving many trees standing after a cut, the logging operation may be less efficient than other methods of logging that do not require such selectivity. Since cherry needs to be clear-cut, logging can be done quickly and at a lower rate than one would expect for other species or when using less industrial methods of logging, like the horse logging used for parts of the LaForce project.

Wood Quality

Middlebury College was faced with numerous decisions regarding design choice for LaForce Hall. One of the more prominent was quality of lumber construction materials. Quality can be further examined in terms of three characteristics: price, source, and aesthetics. For this project, Middlebury College had to work within a somewhat flexible budget to get the product that most closely met its objectives. This involved the desire for green certified wood from local sources if possible. This factor alone had a great impact on wood species selection, but as explained by College Forester Steve Weber, it did not affect the quality of the product.

For the finished woodwork, the architect had originally suggested clear black cherry. This is a highly desirable, clean finished wood, with commercial production centered in Pennsylvania. Pennsylvania black cherry comes with a high price tag, largely due to the high market demand at the time of construction.

When Middlebury College chose to buy green certified wood from VFF, it made a choice to switch to yellow birch and beech instead of cherry. Beech is virtually unattainable commercially. This is not a reflection of actual availability in the forests, but of market demand. Yellow birch is more commercially available, but at a relatively low stumpage rate. Yellow birch and beech have traditionally not been particularly valuable wood products. VFF offers these products because they are what its forests currently can sustainably yield.

This choice did not leave Middlebury with an inferior product in terms of quality, however. The demand for certain species is generally associated with aesthetics. The look and feel of one wood may be more pleasing to the eye than others. Black cherry, for instance, has a rich smooth finish that creates a certain light in a room. Similarly beech and birch offer their own unique characteristics. The price tag is a difficult factor to ignore due to the fact that people generally associate a higher price with a better product. In this instance, however, it is not necessarily the case.

High-grade yellow birch cut for use within LaForce Hall.

To fairly compare two wood species, one must compare the same grades. High-grade cherry and high-grade birch are equally rated by certain industry standards. They are evaluated on characteristics such as splits, shakes, checks, and knots. Certain allowable flaws dictate which grade the lumber falls under based on the industry classification system for all lumber. Switching from cherry to birch and beech did not leave Middlebury with a lesser quality product, but rather a *lesser-valued* product. The Architectural Woodwork Institute ranks wood based on color, grain, pattern, and presence and size of knots. Uniformity generally gains a higher ranking but is usually found in larger diameter trees. High-grading large diameter trees is not always a sustainable practice for forest communities.

In some instances, wood with more "character," such as knots and uneven grain, may be slightly less structurally sound in terms of load bearing capacity. The wood used in LaForce, however, was not used in this manner. It was primarily detailing and meant to increase the aesthetic appeal of the building. VFF has worked to market this aspect throughout many of its projects. In the Bicentennial Hall Science Center at Middlebury College, VFF highlighted some of its wood used for its unique character. The irregularities in the wood bring beauty and history to the areas where they are used. The wood shows its own character through the markings that are left from insects, storms, and dramatic weather events. Initially, woodworkers were confronted with the challenge of working with irregular wood. Once they began to understand that the "character" of the wood did not translate to an inferior product, they began to appreciate the unique beauty of the products created from the wood.

As VFF continues to grow, it will have to better define its market. For species such as birch, it is able to compete in the market in terms of price comparison even with the added cost of green certification. The future appeal of green certification is still largely unknown at this point. As previously discussed, it is unclear whether green certified wood will have the same impact as organic foods in terms of consumer spending and willingness to pay. How much will consumers spend in order to obtain that "feel good" aspect of a green product? Organic foods have been able to compete in the larger market by incorporating perceived health benefits as an added perk of the price. The everyday nature of food purchases increases awareness of what products are on the market. Lumber is not the same type of commodity.

It is as yet unclear, however, how green certified lumber will appeal to consumers in the lumber market. If the question of quality is eliminated for species such as beech, there is the potential for VFF to create a niche market with these lower-valued species. It can then offer green certified lumber at similar or cheaper prices than traditional lumber on the market. If consumers remain skeptical of the overall product quality because of a lack of recognition, it will be difficult for VFF to remain commercially viable. There are three potential outcomes here. First, VFF can continue to try to market its product as is and continue using low value species allowing VFF to pay double stumpage and create its own niche market. Second, it may try to extend its operations to more commercially valuable species and encounter a drastically higher price (as seen with the cost comparison of black cherry), but compete in the larger commercial lumber business. Third, VFF can incorporate both and appeal to all magnitudes of construction. Quality is not being sacrificed with species selection. Consumer preferences are fickle however. VFF must determine how to market its products in light of this fact.

Estimated Costs of Other Options for LaForce Hall

The assumption in Table 1 is that Middlebury would have decided to use non-certified black cherry had it not used lumber from VFF. Admittedly, this represents only one option that Middlebury could have chosen to pursue for the project. What if Middlebury wanted to use cherry, but demanded that it be certified by a recognized green certification program (e.g., FSC)? Or, what if VFF agreed to provide Middlebury with an alternative species of hardwood that had higher stumpage rates (e.g., sugar maple) than the very low-priced yellow birch and beech, while still agreeing to pay double the stumpage rates to landowners?

Table 2: Total cost comparison of potential lumber options for LaForce Hall.

VFF birch/beech	Non-certified cherry	VFF maple	FSC cherry
$67,661	$95,729 - $149,723	$120,900	$114,000 - $155,121

See Appendix 3 for details of total cost figures.

Green certified cherry represents the most expensive option in our estimates. It would have cost more than double the VFF beech and birch (Table 2). If VFF had offered Middlebury sugar maple rather than birch/beech, the costs of the project would have been almost double what they actually were, and would have been comparable to using non-certified or even certified black cherry. This suggests that VFF was very competitive price-wise when low-value species were used, but was less competitive within traditional markets as stumpage rates went up. VFF's costs associated with ensuring that its lumber is processed by green certification systems as well as its insistence on using local infrastructure may be the reason its processing fees (logging, trucking, milling, drying, and sawing) are slightly higher than our estimates for Pennsylvania.

Table 3: Breakdown of costs as a percentage of total cost: VFF beech/birch, PA cherry (mean), and VFF Maple.

Expenses	VFF birch/beech	PA cherry	VFF maple
stumpage	8%	43%	36%
logging	22%	4%	12%
trucking	9%	5%	5%
sawing	20%	13%	11%
milling	2%	1%	1%
drying	10%	5%	6%
Gross profit (40% subtotal)	29%	29%	29%
Total	100%	100%	100%

Also, by paying loggers 1.6 the normal rate, VFF substantially increases its costs of processing hardwood. In fact, in the LaForce Hall project, logging represented a larger percentage of the total cost than any other stage of production. This is in sharp contrast to the estimate for Pennsylvania cherry, where logging was a fairly minor percentage of the total cost (Table 3). Also, stumpage represented a minor proportion of the total cost for VFF but was by far the largest individual cost for the non-certified Pennsylvania cherry. The substantial increase in price estimated for a scenario in which VFF provided sugar maple is accounted for by an increase in the proportion of the cost that would be dedicated to the stumpage fees.

Recommendations for VFF Based on Cost Analysis

1. *Concentrate on using species with low stumpage rates.* As noted above, most consumers are willing to pay a 5% premium for green certified lumber. Yet, it is difficult to compare the total costs presented in our analysis because they are all for different species. However, using VFF's own analysis, we can estimate what the lumber for LaForce would have cost if VFF did not adhere to its goals of paying double stumpage and 1.6 times logging fees (Table 4).

Table 4: Costs of LaForce lumber for VFF and non-VFF firm.

Expenses	**VFF**	**Non-VFF**
stumpage	**$5,139**	**$3,160**
logging	**$15,106**	**$6,855**
trucking	$6,407	$6,407
sawing	$13,811	$13,811
milling	$1,127	$1,127
drying	$6,739	$6,739
subtotal	$48,330	$38,100
Gross profit (40% subtotal)	$19,332	$15,240
Total	**$67,662**	**$53,340**
Premium	**27%**	

The analysis shows that VFF charged a premium of approximately 27% above the estimated cost of providing the lumber with traditional cost scenarios. When dealing with the same species, VFF does not provide the same savings that Middlebury received by choosing the low-value species over the high-priced cherry. Therefore, VFF ought to use low-value species as its primary source for lumber and attempt to sell consumers on the merits of both the lumber, particularly the “character” wood used in LaForce, and its unique value-adding process. Also, VFF should attempt to educate the public about its product by tying the VFF forestry model closely to the marketing of VFF commodities. Indeed, there is more to VFF than simply green certification. VFF could focus on the local aspects of its production process as well as on its efforts to make forestry a sustainable industry in Vermont both ecologically and economically. This can provide consumers with a “feel good” reason for purchasing the product and allow VFF to develop a successful business model by exploiting a well-defined niche. Efforts towards sustainable forestry are being increasingly recognized and acknowledged. For example, Middlebury College won an award from the EPA for using VFF lumber in both Bicentennial Hall and LaForce Hall in April 2003.[19]

2. *Continue to refine the chain of custody*. Some of the high costs associated with the Bicentennial Hall project were related to problems in locating processors (e.g., mills, kilns) that were certified to properly handle VFF lumber. As the market for green certified lumber expands, the availability of such facilities is likely to increase. It is especially important for VFF that mills and kilns with green certification expand in Vermont. A more competitive processing industry for green certified lumber will further help VFF lower its costs and compete with other lumber suppliers.

3. *Transparency is good*. The cost analysis we carried out was made difficult by the lack of transparency in the lumber industry. Wholesalers were very reluctant to provide a breakdown of how they arrived at their total costs. VFF’s remarkable efforts to be transparent about the process benefits both VFF and the consumer. Consumers have a clear idea about where their money has gone, while VFF can use the transparent process to highlight how it benefits local businesses, landowners, and loggers. VFF has discussed marking lumber so that the origin of the lumber consumers purchase is available to them. We encourage VFF to pursue this goal because it ties the customer to the producer and to the land from which the lumber came.

This is likely to increase the “feel good” benefits to both the consumer and the landowner, who can see the end products of her woodlot.

Conclusion

The success of the LaForce Hall project is apparent to anyone who has seen the beautiful ceilings and other woodwork in the structure. VFF offered Middlebury a price far below the other option it considered, clear black cherry. However, the competitiveness of VFF is constrained by the fact that the price it charged for the yellow birch and beech likely represented a fairly substantial premium over regular markets for the same species. More typical consumers may be less willing to pay such a high premium for VFF lumber. VFF can use the LaForce Hall project to recognize its ability to offer competitive prices, and thus grow its clientele. If it can convince consumers that it can offer a product that may be derived from a species with lower stumpage rates but that is, nonetheless, of equal or superior quality and beauty, VFF can contribute to a larger vision of ecological and community stability.

Ecological Effects

"It cannot be good, in the ecological sense, for a farmer to slash the last grove in his community, because in doing so he evicts a fauna, a flora, and a landscape whose membership in the community is older than his own, and is equally entitled to respect."

-Aldo Leopold

A stand of American beech and yellow birch located within a VFF managed forest.

Forestry, of any sort, can upset the natural dynamics of an ecosystem. Ecological effects of logging can be felt by the forest, as well as by the species that live and thrive within it. This section will examine the effects of sustainable logging practices within two types of forests. The logging that occurred within central Vermont in order to obtain the wood for the Middlebury College LaForce project will be assessed and compared to the potential effects of logging that would have occurred in north central Pennsylvania if black cherry had been chosen for the project instead.

There are very apparent differences in species composition within the forests of central Vermont and north central Pennsylvania. The forest from which the wood was cut for the LaForce project is considered a mid-elevation northern hardwood stand. The dominant species are American beech, yellow birch, and sugar maple. The stands that would have potentially been logged if black cherry had been used in the project are comprised predominantly of black cherry yet include birch and sugar maple as well. The species present within both of these forest types have different life histories, which promote and allow for different patterns of growth and regeneration. Most importantly, the species present within Vermont are all shade tolerant and are capable of growing within small gaps in the canopy. Cherry is much less shade tolerant, and needs more light in order for successful growth to occur. Such differences need to be examined and compared to one another in order to determine which forest type has the potential to be more severely affected by the impacts of logging.

Disturbance History

In order to understand the ecological development of a forest stand or predict its response to specific management practices, it is essential to know its disturbance history. This is especially true for forests that are now the focus of intensive management. By better understanding the past occurrences within a stand, there is a greater chance that we will be able to maintain sustainability in the future. Both stands examined within this analysis have been affected by natural and human induced disturbances, which, in turn, have had an impact on overall species composition and diversity.

Central Vermont

The species composition of the central Vermont forests was affected by logging activity and agriculture expansion in the 1800s.[20] This deforestation continued to occur late into the nineteenth century, peaking around 1880 when more than 80% of all land in New England was open. Since this time forest re-growth has occurred. Currently, most of Vermont forests consist of fairly young, even-aged second and third growth stands. As forests have grown back, a shift in species abundance have occurred. Species composition data reveal an increase in birch (11% increase from 1802-1962) and a dramatic decrease in beech populations (a 36% decrease).[21]

Since the late nineteenth century, the only major disturbances that have affected the Vermont forested landscapes have been natural. Two of the largest natural disturbances were recorded in the years 1950 and 1998. The Great Appalachian Windstorm of 1950 caused a significant amount of wind related damage in the Green Mountains. The 1998 ice storm was the cause of further damage within the forest and was responsible for creating additional gaps within the canopy. These two recent disturbances have created gaps, which have allowed for uneven-aged stands to successfully develop and maintain vertical diversity within the forests. In addition to these natural disturbances, there has also been continuous selective cutting within Vermont hardwood stands. This type of logging attempts to mimic the gaps created by natural disturbances in hopes that the same type of uneven, vertically diversified re-growth will occur.

North Central Pennsylvania

Prior to European settlement the forests of this region were dominated by vast stands of old-growth hemlock and beech.[22] However, extensive harvesting between 1890 and 1930 that coincided with the chemical wood industry virtually wiped out all forest cover.[23] The heavy cutting favored hardwoods and created massive amounts of coniferous slash, providing ideal conditions for widespread and intense fires. The fires were a major factor in the virtual elimination of white pine and hemlock in the Allegheny forests.[24]

After landscape level cutting had ceased, even-aged stand growth occurred. This re-growth enabled the forest to shift to its current composition dominated by hardwoods such as black cherry, ash, and yellow poplar. Within this analysis, the most important of these three species is black cherry. This shade intolerant, rapid-growing species has been able to thrive in this area where landscape-level cutting has occurred. Reports conveying pre (1793-1819) and post (1973) settlement species composition data show a 22% increase in black cherry over the past century and a half.[25]

An increasing deer population within the region has also aided the increase in cherry. Deer browse on seedlings and saplings and hinder many species from ever growing into the canopy. Black cherry seedlings are not very palatable and have caused black cherry populations to be quite resilient to the effects of deer browsing.[26]

Pertinent Species

Looking at the life history (in terms of seedling/sapling development as well as growth rates) of a species is quite helpful in determining how a species will react to logging and how easily regeneration and re-establishment will be able to occur. Our analysis looks at and compares the re-growth and regeneration patterns of yellow birch, beech, and black cherry.

American Beech (Fagus grandifolia)

Beech seedlings tend to develop better under a moderate canopy or in protected small openings than they do in large open areas. Root development has also been shown to be greatest under conditions of moderate shade. Seedlings can exist under dense stands, however growth rates are much slower. Annual increase in diameter averages between 1.8 and 2.3 m/yr in undisturbed second-growth stands and is increased to 3.8-4.8 m/yr in partially or selectively cut stands.

Yellow Birch (Betula alleghaniensis)

Under dense forest canopies, yellow birch roots grow slower than their forest associates and can easily be out-competed. Adequate seed supply, favorable weather, proper seedbed conditions, and adequate light are all needed for successful establishment to occur. Because of so many influential factors, few yellow birch are able to establish under selective cutting. Growth rates of yellow birch are quite slow; diameter at breast height (DBH) growth rates in unmanaged stands average 0.25 cm/yr. In comparison to other associated species, yellow birch is incredibly susceptible to damage from both human and natural disturbances.

Black Cherry (Prunus serotina)

Black cherry is a shade intolerant species. In stands where all species establish at the same time, cherry quickly overtops shade tolerant species. However, in conditions of shade, growth rates are decreased, and cherry can be out-competed. Under such conditions it is far less likely that cherry will ever grow into the canopy. In even-aged stands black cherry grows very fast through seedling and sapling stages. Average annual DBH growth rates are 0.5 cm/yr. Due to shade intolerance and black cherry competition capabilities, even-aged cutting is the best forestry management practice for this species. Uneven-aged cutting has been proven to gradually reduce cherry abundance within stands.

Forest Management Practices

Proper forest management helps ensure that whenever humans influence the forest ecosystem, impacts are not detrimental to the forest's long-term health and environmental quality. Since forest ecosystems are dynamic, the best management strategies work with, rather than against, natural changes. It is important to acknowledge that all stands are looked at on an individual level. There is no blanket prescription designated within any type of management plan. Management is dependent on species composition, gap dynamics, topography, and geomorphology of the forest floor. A silviculturist is responsible for looking at and assessing stands on a site-by-site basis. As mentioned above, VFF emphasizes the importance of stand-by-stand management while upholding blanket standards for all logging practices that occur on VFF managed land. These standards surpass those that are necessary for green certification status, and are used in an attempt to maintain forest sustainability and stand vitality.

There are two very different management practices used for northern hardwood stands in central Vermont and black cherry stands in north central Pennsylvania. Both practices highlight and promote the specific needs of each stand.

Central Vermont: Selective Cutting/Uneven-Aged Stands

This process involves frequent selective harvesting to maintain a mix of tree sizes, ages, and classes. It may approximate natural tree loss during the progression of the forest, which over time shifts species toward shade tolerant varieties. In this type of management, regeneration is slower and can be affected by deer browsing. One of the benefits, however, is an increase in vertical diversity. This, in turn, promotes and sustains high biological diversity within the stand.

For the LaForce project harvest, selective cutting was utilized. VFF used a Forest Management Checklist (Appendix 4) in order to promote ecological sustainability within the selection process. Access to the forest was restricted in order to achieve a minimal impact on the forest landscape. The use of skid trails, truck roads, and log landings were limited as well. Protective strips and buffer strips were created (or maintained) around sensitive areas and streams. Canopy gaps were kept to a minimum, coarse woody debris and snags were left in the forest, and soil and erosion factors were considered. All this was done in hopes to mimic the effects that would occur following a natural disturbance (such as a hurricane or windstorm) as well as to keep the forest from becoming "oversimplified" due to a loss of resources.

North Central Pennsylvania: Clear-Cutting/Even-Aged Stands

A stand is even-aged when all of the trees are approximately the same age, generally because of their simultaneous regeneration. This is the case for much of the forest growth in north central Pennsylvania. In this method, a large abundance of trees is cut from a single area creating a large opening in the forest canopy. Most often such practices of patch clear-cuts incorporate a diameter limit on all cutting. Typically such clear-cuts allow for removal of all trees over a 14" DBH. Such a practice removes most of the canopy trees within an area and leaves only smaller suppressed saplings, which can then grow into the canopy due to an increase in light exposure. When even-aged stand cutting occurs, advanced seedlings and seeds stored in the forest floor generally allow for rapid stand reestablishment and regeneration.

Since black cherry are classified as shade-intolerant, clear-cutting has been widely utilized; however, effects on other forest species and organisms should also be taken into consideration.[27] When a forest is clear-cut and the proper precautions are not taken (in terms of maintaining sufficient natural resources within the forest systems), biological diversity and abundance can become severely reduced.

Another factor that needs to be considered under this management practice is time scale. Obviously, re-growth cannot occur overnight. Not only is resource abundance unavoidably reduced, there can also be aesthetic concerns that need to be addressed (particularly in north central Pennsylvania where a large emphasis is made on utilizing forested landscape for recreation).

Biological Considerations

The biological effects of forestry must also be considered. Many forms of wildlife use trees – both dead and alive – as a means of food and for protection. Many species of bird require young saplings for feeding and nesting during the summer. Coarse, woody debris provides many invertebrates, vertebrates, and plant life with the proper environments for growth and survival. Timber management practices can also have effects on the landscape of a stand. Logging roads and skid trails can create extra run-off and induce an excessive loss of soil and nutrients along areas of high gradient (slopes higher than 10%).

Rare Biological Species in Central Vermont

Within Vermont hardwoods, the species gaining the most attention is the Indiana bat. This species, first listed as “endangered” in 1967 by the US Fish and Wildlife Service, uses trees within hardwood forest stands for summer roosting. Because of this species’ threatened status, forests are managed and monitored in such a way to protect these roosting grounds.[28] Peregrine falcons are also a species that draw a great deal of attention. Range-wide threats to this species include human disturbance of nesting sites as well as habitat modification. Current recovery initiatives include nesting pair monitoring, human access restrictions, and logging restrictions. Table 5 lists endangered, threatened, and sensitive species found in the Green Mountain National Forest.[29]

Table 5. All threatened biological species within the Green Mountain National Forest.

Species	Status
Indiana Bat	Endangered
Peregrine Falcon	Sensitive
Bicknell's thrush	Sensitive
Common loon	Sensitive
Eastern small-footed bat	Sensitive
Jefferson salamander	Sensitive
Wood turtle	Sensitive
Brook floater	Sensitive
Creek heelsplitter	Sensitive
Black -tipped darner	Sensitive
Green-striped garner	Sensitive
Lilypad clubtail	Sensitive
Superb jewelwing	Sensitive
Cobblestone tiger beetle	Sensitive
Harpoon clubtail	Sensitive
Mustached clubtail	Sensitive
Southern pygmy clubtail	Sensitive
Amber-winged spreadwing	Sensitive
Maine snaketail	Sensitive
Ski-tailed emerald	Sensitive
Forcipate emerald	Sensitive
Ocellated emerald	Sensitive
Arctic bentgrass	Sensitive
Fernleaf yellow false-foxglove	Sensitive
Hairy woodmint	Sensitive
New England northern reed grass	Sensitive
Small-flower bitter-cress	Sensitive
Summer sedge	Sensitive
Water sedge	Sensitive
Hay sedge	Sensitive
Prickly bog sedge	Sensitive
Bigelow sedge	Sensitive
Bronze sedge	Sensitive
Shore sedge	Sensitive
Michaux sedge	Sensitive
Schweinitz's sedge	Sensitive
Bulrush sedge	Sensitive

Rare Biological Species in North Central Pennsylvania

Similar to Vermont forest stands, the species that draws the most concern within Pennsylvania hardwood stands is the Indiana bat. Over the past few years there has been an apparent decline in population. In order to compensate, the US Forest Service actively manages forests where this species is known to exist in hopes of providing the bat with adequate habitat (including sources of water, roosting, and foraging areas).

Though the Indiana bat receives the most attention, other species are also considered before forest management practices and policies are put into affect (Table 6).[30] If black cherry cutting is not managed properly and effectively in central Pennsylvania, limited foraging resources could occur. Furthermore, clear-cutting may affect the vertical diversity of a landscape and create a loss of adequate nesting and roosting habitat for other species.

Table 6. All threatened biological species within the Allegheny National Forest.

Species	Status
Indiana bat	Endangered
Clubshell mussel	Endangered
Northern riffleshell	Endangered
Bald eagle	Threatened
Small-whorled pogonia	Threatened
Timber rattlesnake	Sensitive
Yellow-bellied flycatcher	Sensitive
Northern long-eared bat	Sensitive
Northern water shrew	Sensitive
Green faced clubtail	Sensitive
Long-soild mussel	Sensitive
Harpoon clubtail	Sensitive
Rapids clubtail	Sensitive
Mustached clubtail	Sensitive
Midland clubtail	Sensitive
Ski-tailed clubtail	Sensitive
Species, cont.	**Status**
Uhler's sundragon	Sensitive
Maine snaketail	Sensitive
Zebra clubtail	Sensitive
Wiegand's sedge	Sensitive
Butternut	Sensitive
Creeping snowberry	Sensitive
Thread rush	Sensitive
Rough cotton-graph	Sensitive
Spotted darter	Sensitive
Tippecanoe darter	Sensitive
Longhead darter	Sensitive
Mountain brook lamprey	Sensitive
Gravel chub	Sensitive
Channel darter	Sensitive
Gilt darter	Sensitive

Potential Effects on Species Composition and Overall Stand Health

It is hard to directly compare the effects of the forestry practices executed for the LaForce project to the potential effects of harvesting black cherry in north central Pennsylvania because the species composition of these two regions is drastically different. For this reason, it is only possible to suggest the potential affects that may occur within each of the two forest stands being analyzed.

Central Vermont

Within the forests of Vermont patterns of natural succession have resulted in a shift away from a predominantly beech canopy. Currently the canopy is composed of beech, birch, and sugar maple. With the type of selective cutting that occurred for the LaForce project, regeneration and re-growth capabilities must be considered. Beech have the most difficult time with regeneration in gaps created by the removal of other canopy beech trees. Yet, re-establishment has been shown to be much more successful under gaps created by the removal of sugar maples.[31] These gap regeneration dynamics may have affects on overall stand composition. However, it should be noted that over the past decade and a half Vermont statewide surveys have revealed an overall increase in hardwood tree health. Thus, though regeneration and re-establishment of hardwoods should be a factor that must be considered, it is highly unlikely that this will cause a threat to the over-all stand health or species composition.

Another factor that needs to be taken into consideration is herbivory. Within Vermont forests deer populations have increased dramatically over the past century. This population growth has caused an increase in browsing.[32] Many hardwoods are quite palatable and, thus, establishment and regeneration can be effected severely by deer browsing. This is a factor that may hinder re-growth within Vermont stands.

North Central Pennsylvania

Within the forests of north central Pennsylvania, the factor that needs to be considered most heavily is stand age. Because most black cherry stands are of even-age within an area, proper management practices are essential. Logging must occur in such a way that will not hinder overall health of the forest. There are many speculations that this is not necessarily the case. There has been much debate over forest management practices that have recently been carried out within these stands. Clear-cuts have been followed by extensive pesticide use in order to promote re-growth of black cherry.[33] This hinders patterns of natural succession and has the potential to lead to a mono-crop of black cherry. Such an occurrence would lead to a the potential to lead to a mono-crop of black cherry. Such an occurrence would lead to a depletion of resources and habitat that may have been provided by other species within the forest.

Conclusion

It is inevitable that any type of forest management will have some type of effect on forest composition and dynamics. Thus, it is the degree of these effects that should be assessed. Selective cutting, by mimicking natural disturbances, if done properly, can have the least impacts on a forest community. One of the principles that VFF has adopted states that "ecological forestry should conserve native biodiversity, water quality, site productivity, and scenic beauty; use only biological pest control; and mimic natural processes."[34] Such standards were upheld in the logging the occurred for the LaForce project at Middlebury College.

If black cherry had been used in this project, the potential logging would have involved much larger scale clear-cuts. Though forestry management practices would have allowed for the re-growth of cherry stands, the effects of the cuts would have been much more wide-scale and would also significantly hinder the forests' natural process of succession. Thus, since a goal of Middlebury College was to choose a wood that would create the least amount of disturbance and have minimal effects on the natural dynamic of a forest, the College's choice to use VFF wood appears better for the forest. Its choice to use VFF wood from central Vermont forests was a wise one in that it maintained the health and integrity of the natural environment.

Above: Skid trail on Middlebury College lands in Ripton, VT.
Below: Recovering skid trail after completion of logging.

Final Conclusions and Recommendations

"[The true problem of land-use] is to achieve both utility and beauty, and thus permanence."

-Aldo Leopold

This report examined the construction of LaForce Hall as a process involving decisions about community, economics, and ecology that were influenced by a belief in the value of locally-harvested, green certified hardwood. The decision to work through Vermont Family Forests was analyzed alongside a hypothetical alternative – Pennsylvania black cherry. We have tried to remain objective in our scrutiny of the processes involved so as to provide a clear vision of the strengths and weaknesses of each alternative.

Vermont Family Forests draws its strength from the trust and transparency it has developed with its clients and customers. The ability of VFF employees and partners to interact on a personal level creates conditions for effective communication and collaboration that seems to lead to a better business relationship. Given the significance of these personal relationships for VFF, the potential scale of its operations is limited if it wants to preserve the strength of its current partnerships. We contend that VFF will operate best at a scale where it does not lose the local feel and familiarity it currently enjoys. Therefore, VFF ought to focus on local markets and consumers as it continues to develop its sustainable forestry model.

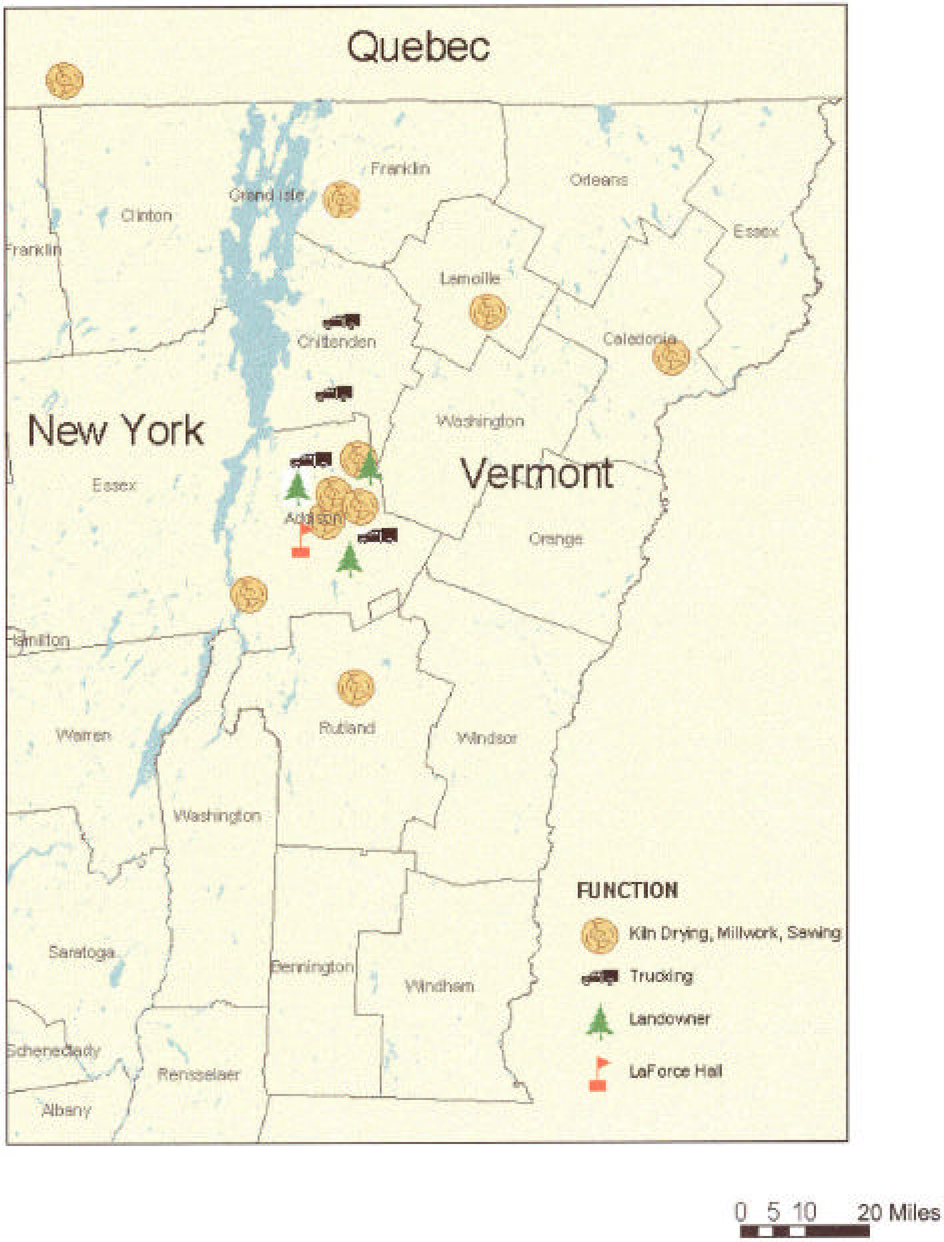
VFF's association with FSC and green certification needs to be monitored. The ambiguity among different green certification systems may serve to hurt the sustainable forestry industry by failing to provide a clear vision of what green certification represents. By aligning itself with a known green certifier, VFF may gain the legitimatization necessary in current green certified lumber markets. However, VFF can and should continue to go beyond the standards of green certification systems. As it does so, it should attempt to educate its consumers and local community members about the value of its vision of sustainable forestry – a vision that is far more ambitious than any current green certification system.

The comparison of the ecological effects of harvesting the VFF lumber and the Pennsylvania black cherry suggests that the yellow birch and beech used in LaForce had less of an impact on the forest than the cherry would have had. VFF's logging practices contributed to reducing the disturbance of timber stands. While we cannot be sure what the exact implications of harvesting cherry in Pennsylvania would have been, we remain confident that VFF aimed to acquire the lumber for LaForce in the most ecologically sensitive way it could.

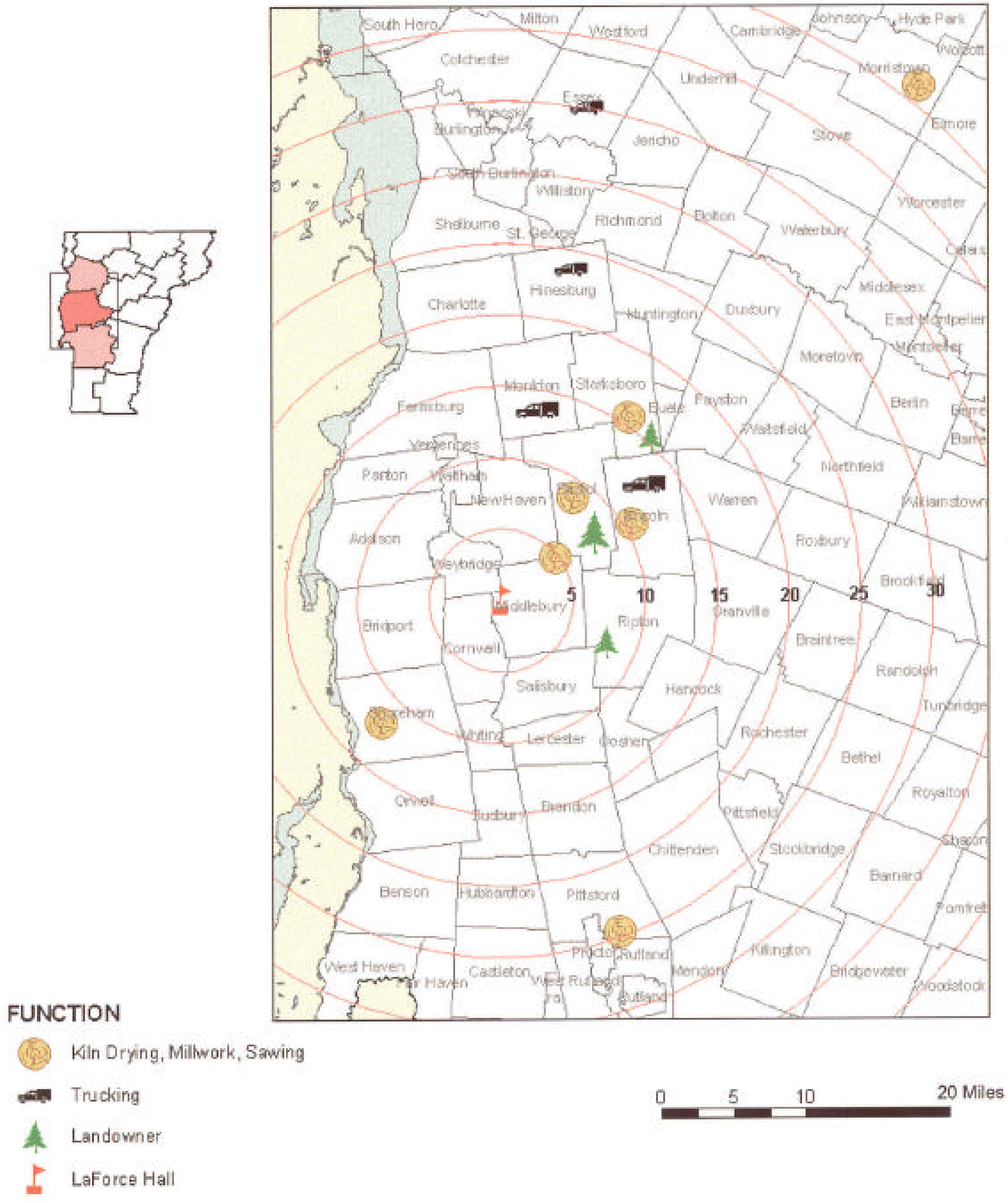
Middlebury saved money by choosing to use local wood from VFF instead of Pennsylvania cherry. Most of this savings came from using lower value species. VFF charged a large premium for the birch and beech compared to estimates of traditional market prices. We suspect that it will need to work to reduce the premium it charges on lumber if it hopes to expand and compete in the lumber market. VFF ought to concentrate on using low-value, high-quality species in its projects. It should market its products so as to educate consumers about the value and beauty of character wood. VFF should also work to highlight the economic importance of its forestry model to the forest products industry and forested landscape in Vermont, which consists mostly of small woodlot owners struggling to make a profit.

VFF and Middlebury College have developed a strong relationship and share a similar vision of the importance of sustainable forestry and local economic development. The relationship has been mutually beneficial. VFF’s involvement in two large projects at Middlebury has allowed it to further develop and grow as an organization. Middlebury has reaped the benefits of using a beautiful, locally-harvested, and sustainably-managed product. Beyond the product itself, Middlebury can use its involvement with VFF to show how it acts on its vision of environmental excellence. The willingness to take action and affect change sets an example for Middlebury’s students and can help distinguish Middlebury from its competitors.

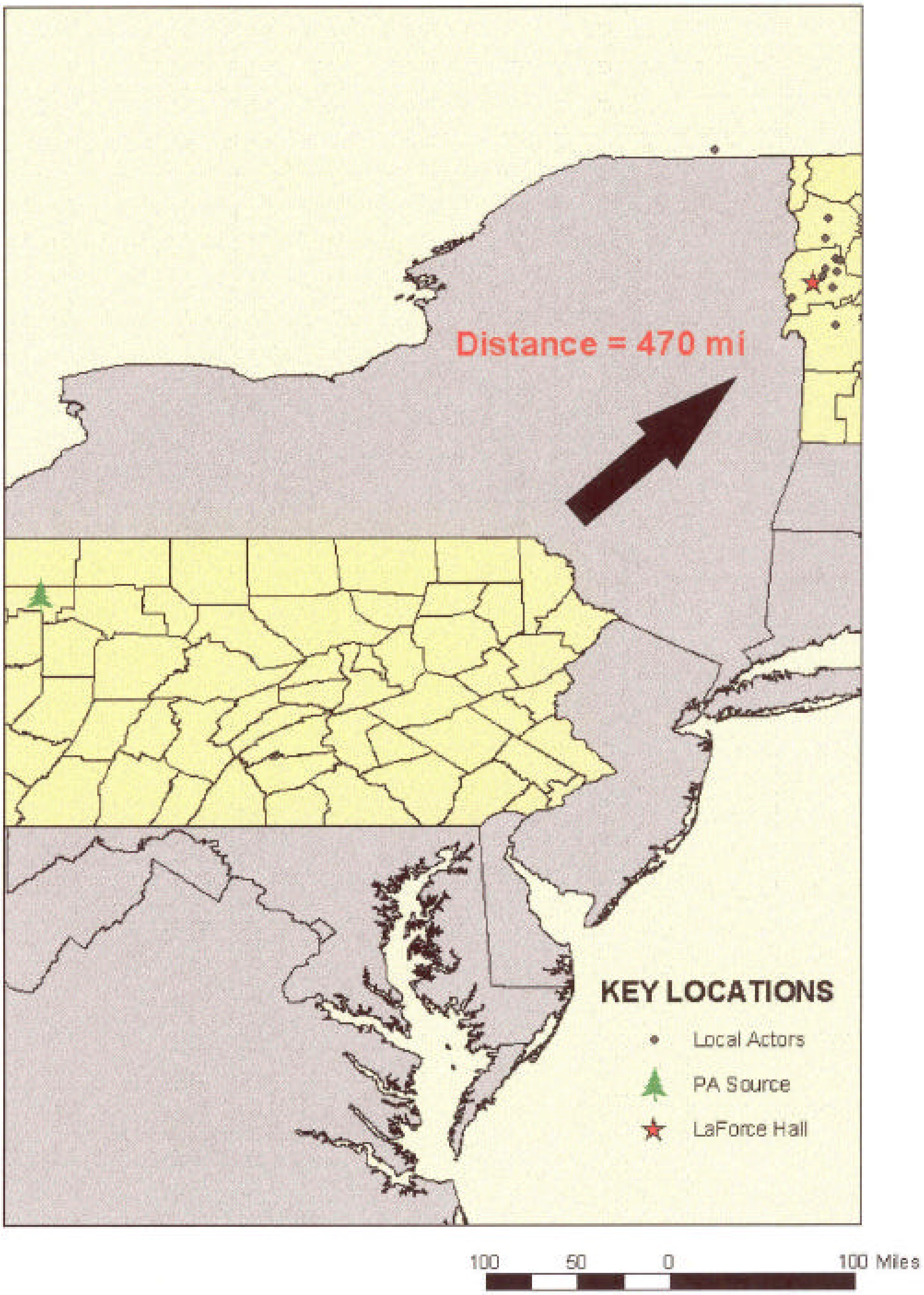
Location of Key Actors in the VFF LaForce Project



Close Up of Key Actors in the VFF LaForce Project with Mileage Circles (r = 5 mi)



The Theoretical Pennsylvania Scenario versus the Decision to Use Local Wood



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Appendix 1: Interview Questionnaire

I. Individuals/groups involved in VFF projects

1. What is your connection with VFF?
2. How did you become involved and what was your role?
3. What were your main reasons for involvement?
   Economic: benefits?
   Community: Why/how have you created this commitment to the community? Has VFF enhanced this relationship?
   Environmental: How did you develop this environmental ethic/concern?
4. What is your overall assessment of your involvement with the project and the project as a whole? Suggestions for improvement?
5. What kinds of forestry projects have you been involved with in the past?

II. Potential individuals/groups

1. What is your role in the forestry industry?
2. What is your idea of sustainable forestry?
3. What do you know about VFF?
4. What are your reasons for supporting/opposing sustainable forestry?
   Economic: If there is more economic cost how would you justify/promote this type of forestry? Is it feasible?
   Community: Why/how have you created this commitment to the community?
   Environmental: How did you develop this environmental ethic/concern?
5. In your opinion, is VFF's mission realistic?

Appendix 2: FSC Standards

PRINCIPLE #1: COMPLIANCE WITH LAWS AND FSC PRINCIPLES
Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.

1.1 Forest management shall respect all national and local laws and administrative requirements.

1.2 All applicable and legally prescribed fees, royalties, taxes and other charges shall be paid.

1.3 In signatory countries, the provisions of all binding international agreements such as CITES, ILO Conventions, ITTA, and Convention on Biological Diversity, shall be respected.

1.4 Conflicts between laws, regulations and the FSC Principles and Criteria shall be evaluated for the purposes of certification, on a case by case basis, by the certifiers and the involved or affected parties.

1.5 Forest management areas should be protected from illegal harvesting, settlement and other unauthorized activities.

1.6 Forest managers shall demonstrate a long-term commitment to adhere to the FSC Principles and Criteria.

PRINCIPLE #2: TENURE AND USE RIGHTS AND RESPONSIBILITIES
Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established.

2.1 Clear evidence of long-term forest use rights to the land (e.g. land title, customary rights, or lease agreements) shall be demonstrated.

2.2 Local communities with legal or customary tenure or use rights shall maintain control, to the extent necessary to protect their rights or resources, over forest operations unless they delegate control with free and informed consent to other agencies.

2.3 Appropriate mechanisms shall be employed to resolve disputes over tenure claims and use rights. The circumstances and status of any outstanding disputes will be explicitly considered in the certification evaluation. Disputes of substantial magnitude involving a significant number of interests will normally disqualify an operation from being certified.

PRINCIPLE #3: INDIGENOUS PEOPLES' RIGHTS
The legal and customary rights of indigenous peoples to own, use and manage their lands, territories, and resources shall be recognized and respected.

3.1 Indigenous peoples shall control forest management on their lands and territories unless they delegate control with free and informed consent to other agencies.

3.2 Forest management shall not threaten or diminish, either directly or indirectly, the resources or tenure rights of indigenous peoples.

3.3 Sites of special cultural, ecological, economic or religious significance to indigenous peoples shall be clearly identified in cooperation with such peoples, and recognized and protected by forest managers.

3.4 Indigenous peoples shall be compensated for the application of their traditional knowledge regarding the use of forest species or management systems in forest operations. This compensation shall be formally agreed upon with their free and informed consent before forest operations commence.

PRINCIPLE #4: COMMUNITY RELATIONS AND WORKER'S RIGHTS

Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities.

4.1 The communities within, or adjacent to, the forest management area should be given opportunities for employment, training, and other services.

4.2 Forest management should meet or exceed all applicable laws and/or regulations covering health and safety of employees and their families.

4.3 The rights of workers to organize and voluntarily negotiate with their employers shall be guaranteed as outlined in Conventions 87 and 98 of the International Labour Organisation (ILO).

4.4 Management planning and operations shall incorporate the results of evaluations of social impact. Consultations shall be maintained with people and groups directly affected by management operations.

4.5 Appropriate mechanisms shall be employed for resolving grievances and for providing fair compensation in the case of loss or damage affecting the legal or customary rights, property, resources, or livelihoods of local peoples. Measures shall be taken to avoid such loss or damage.

PRINCIPLE # 5: BENEFITS FROM THE FOREST

Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.

5.1 Forest management should strive toward economic viability, while taking into account the full environmental, social, and operational costs of production, and ensuring the investments necessary to maintain the ecological productivity of the forest.

5.2 Forest management and marketing operations should encourage the optimal use and local processing of the forest's diversity of products.

5.3 Forest management should minimize waste associated with harvesting and on-site processing operations and avoid damage to other forest resources.

5.4 Forest management should strive to strengthen and diversify the local economy, avoiding dependence on a single forest product.

5.5 Forest management operations shall recognize, maintain, and, where appropriate, enhance the value of forest services and resources such as watersheds and fisheries.

5.6 The rate of harvest of forest products shall not exceed levels which can be permanently sustained.

PRINCIPLE #6: ENVIRONMENTAL IMPACT

Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest.

6.1 Assessment of environmental impacts shall be completed -- appropriate to the scale, intensity of forest management and the uniqueness of the affected resources -- and adequately integrated into management systems. Assessments shall include landscape level considerations as well as the impacts of on-site processing facilities. Environmental impacts shall be assessed prior to commencement of site-disturbing operations.

6.2 Safeguards shall exist which protect rare, threatened and endangered species and their habitats (e.g., nesting and feeding areas). Conservation zones and protection areas shall be established, appropriate to the scale and intensity of forest management and the uniqueness of the affected resources. Inappropriate hunting, fishing, trapping and collecting shall be controlled.

6.3 Ecological functions and values shall be maintained intact, enhanced, or restored, including:

a) Forest regeneration and succession.
b) Genetic, species, and ecosystem diversity.
c) Natural cycles that affect the productivity of the forest ecosystem.

6.4 Representative samples of existing ecosystems within the landscape shall be protected in their natural state and recorded on maps, appropriate to the scale and intensity of operations and the uniqueness of the affected resources.

6.5 Written guidelines shall be prepared and implemented to: control erosion; minimize forest damage during harvesting, road construction, and all other mechanical disturbances; and protect water resources.

6.6 Management systems shall promote the development and adoption of environmentally friendly non-chemical methods of pest management and strive to avoid the use of chemical pesticides. World Health Organization Type 1A and 1B and chlorinated hydrocarbon pesticides; pesticides that are persistent, toxic or whose derivatives remain biologically active and accumulate in the food chain beyond their intended use; as well as any pesticides banned by international agreement, shall be prohibited. If chemicals are used, proper equipment and training shall be provided to minimize health and environmental risks.

6.7 Chemicals, containers, liquid and solid non-organic wastes including fuel and oil shall be disposed of in an environmentally appropriate manner at off-site locations.

6.8 Use of biological control agents shall be documented, minimized, monitored and strictly controlled in accordance with national laws and internationally accepted scientific protocols. Use of genetically modified organisms shall be prohibited.

6.9 The use of exotic species shall be carefully controlled and actively monitored to avoid adverse ecological impacts.

6.10 Forest conversion to plantations or non-forest land uses shall not occur, except in circumstances where conversion:
a) entails a very limited portion of the forest management unit; and
b) does not occur on high conservation value forest areas; and
c) will enable clear, substantial, additional, secure, long term conservation benefits across the forest management unit.

PRINCIPLE #7: MANAGEMENT PLAN

A management plan -- appropriate to the scale and intensity of the operations -- shall be written, implemented, and kept up to date. The long term objectives of management, and the means of achieving them, shall be clearly stated.

7.1 The management plan and supporting documents shall provide:
a) Management objectives.
b) Description of the forest resources to be managed, environmental limitations, land use and ownership status, socio-economic conditions, and a profile of adjacent lands.
c) Description of silvicultural and/or other management system, based on the ecology of the forest in question and information gathered through resource inventories.
d) Rationale for rate of annual harvest and species selection.
e) Provisions for monitoring of forest growth and dynamics.
f) Environmental safeguards based on environmental assessments.
g) Plans for the identification and protection of rare, threatened and endangered species.
h) Maps describing the forest resource base including protected areas, planned management activities and land ownership.
i) Description and justification of harvesting techniques and equipment to be used.

7.2 The management plan shall be periodically revised to incorporate the results of monitoring or new scientific and technical information, as well as to respond to changing environmental, social and economic circumstances.

7.3 Forest workers shall receive adequate training and supervision to ensure proper implementation of the management plan.

7.4 While respecting the confidentiality of information, forest managers shall make publicly available a summary of the primary elements of the management plan, including those listed in Criterion 7.1.

PRINCIPLE #8: MONITORING AND ASSESSMENT

Monitoring shall be conducted -- appropriate to the scale and intensity of forest management -- to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.

8.1 The frequency and intensity of monitoring should be determined by the scale and intensity of forest management operations as well as the relative complexity and fragility of the affected environment. Monitoring procedures should be consistent and replicable over time to allow comparison of results and assessment of change.

8.2 Forest management should include the research and data collection needed to monitor, at a minimum, the following indicators:

a) Yield of all forest products harvested.
b) Growth rates, regeneration and condition of the forest.
c) Composition and observed changes in the flora and fauna.
d) Environmental and social impacts of harvesting and other operations.
e) Costs, productivity, and efficiency of forest management.

8.3 Documentation shall be provided by the forest manager to enable monitoring and certifying organizations to trace each forest product from its origin, a process known as the "chain of custody."

8.4 The results of monitoring shall be incorporated into the implementation and revision of the management plan.

8.5 While respecting the confidentiality of information, forest managers shall make publicly available a summary of the results of monitoring indicators, including those listed in Criterion 8.2.

PRINCIPLE 9: MAINTENANCE OF HIGH CONSERVATION VALUE FORESTS
Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

9.1 Assessment to determine the presence of the attributes consistent with High Conservation Value Forests will be completed, appropriate to scale and intensity of forest management.

9.2 The consultative portion of the certification process must place emphasis on the identified conservation attributes, and options for the maintenance thereof.

9.3 The management plan shall include and implement specific measures that ensure the maintenance and/or enhancement of the applicable conservation attributes consistent with the precautionary approach. These measures shall be specifically included in the publicly available management plan summary.

9.4 Annual monitoring shall be conducted to assess the effectiveness of the measures employed to maintain or enhance the applicable conservation attributes.

PRINCIPLE # 10: PLANTATIONS
Plantations shall be planned and managed in accordance with Principles and Criteria 1 - 9, and Principle 10 and its Criteria. While plantations can provide an array of social and economic benefits, and can contribute to satisfying the world's needs for forest products, they should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

10.1 The management objectives of the plantation, including natural forest conservation and restoration objectives, shall be explicitly stated in the management plan, and clearly demonstrated in the implementation of the plan.

10.2 The design and layout of plantations should promote the protection, restoration and conservation of natural forests, and not increase pressures on natural forests. Wildlife corridors, streamside zones and a mosaic of stands of different ages and rotation periods, shall be used in the layout of the plantation, consistent with the scale of the operation. The scale and layout of plantation blocks shall be consistent with the patterns of forest stands found within the natural landscape.

10.3 Diversity in the composition of plantations is preferred, so as to enhance economic, ecological and social stability. Such diversity may include the size and spatial distribution of management units within the landscape, number and genetic composition of species, age classes and structures.

10.4 The selection of species for planting shall be based on their overall suitability for the site and their appropriateness to the management objectives. In order to enhance the conservation of biological diversity, native species are preferred over exotic species in the establishment of plantations and the restoration of degraded ecosystems. Exotic species, which shall be used only when their performance is greater than that of native species, shall be carefully monitored to detect unusual mortality, disease, or insect outbreaks and adverse ecological impacts.

10.5 A proportion of the overall forest management area, appropriate to the scale of the plantation and to be determined in regional standards, shall be managed so as to restore the site to a natural forest cover.

10.6 Measures shall be taken to maintain or improve soil structure, fertility, and biological activity. The techniques and rate of harvesting, road and trail construction and maintenance, and the choice of species shall not result in long term soil degradation or adverse impacts on water quality, quantity or substantial deviation from stream course drainage patterns.

10.7 Measures shall be taken to prevent and minimize outbreaks of pests, diseases, fire and invasive plant introductions. Integrated pest management shall form an essential part of the management plan, with primary reliance on prevention and biological control methods rather than chemical pesticides and fertilizers. Plantation management should make every effort to move away from chemical pesticides and fertilizers, including their use in nurseries. The use of chemicals is also covered in Criteria 6.6 and 6.7.

10.8 Appropriate to the scale and diversity of the operation, monitoring of plantations shall include regular assessment of potential on-site and off-site ecological and social impacts, (e.g. natural regeneration, effects on water resources and soil fertility, and impacts on local welfare and social well-being), in addition to those elements addressed in principles 8, 6 and 4. No species should be planted on a large scale until local trials and/or experience have shown that they are ecologically well-adapted to the site, are not invasive, and do not have significant negative ecological impacts on other ecosystems. Special attention will be paid to social issues of land acquisition for plantations, especially the protection of local rights of ownership, use or access.

10.9 Plantations established in areas converted from natural forests after November 1994 normally shall not qualify for certification. Certification may be allowed in circumstances where sufficient evidence is submitted to the certification body that the manager/owner is not responsible directly or indirectly of such conversion.

The FSC Founding Members and Board of Directors ratified principles 1-9 in September 1994.

The FSC Members and Board of Directors ratified principle 10 in February 1996.

The revision of Principle 9 and the addition of Criteria 6.10 and 10.9 were ratified by the FSC Members and Board of Directors in January 1999.

The definition of Precautionary Approach was ratified during the 1999 FSC General Assembly in June 1999.

Appendix 3: Economic Analysis

Table 1 - Pennsylvania Estimate

Stumpage: Low and mean values derived by using an average value for black cherry stumpage in western Pennsylvania in the third quarter of 2001. High value was calculated as one standard deviation above the mean. Data available from Pennsylvania Woodlands Timber Market Report (http://www.cas.psu.edu/docs/CASDEPT/FOREST/TMR/2001/3-01/Prices3.html).

Logging: Range given by Martin Melville, a personal contact familiar with Pennsylvania logging rates. The logging rates used were $60-120/mbf. This was multiplied by 43.376 mbf - the amount of timber logged for the LaForce project as reported by VFF.

Trucking: Obtained by adding the estimated total costs of several stages of trucking from a range of values reported by VFF for former projects:
Total trucking = log trucking + green lumber trucking + dry lumber trucking + delivery. High, low, mean values per mbf as well as the board feet by which each was multiplied to get a subtotal as shown below. The "log truck" value was multiplied by 43.376 mbf because this was the total footage of logs cut for the LaForce project. After the logs were sawed, the remaining "green lumber" was only 33.205 mbf.

Breakdown of trucking costs.

	low	high	mean	mbf
log trucking	$1,952	$3,036	$2,494	43.376
green lumber	$697	$1,660	$1,179	33.205
dry lumber	$731	$1,395	$1,063	33.205
delivery	$1050	$1050	$1050	33.205
Total	**$4,430**	**$7,141**	**$5,786**	

Sawing: Estimated using a range of values reported by VFF for 14 previous projects. The high and low from these 14 projects were used as the high and low for Pennsylvania and the mean was calculated as: *(high+low)/2.*

Milling: Used the same value as VFF. Given that it was such a minor cost, no range was used. The process would likely have cost the same for both projects given that milling would have likely taken place locally, not in Pennsylvania.

Drying: Used a range of values reported by VFF for previous projects that involved large volumes of lumber. Since the range reported by VFF was very large, we used only those reports with greater than 10 mbf volume. These fell within a range of $150-180/mbf. These values were multiplied by 33.205/mbf, the volume of the two cuts.

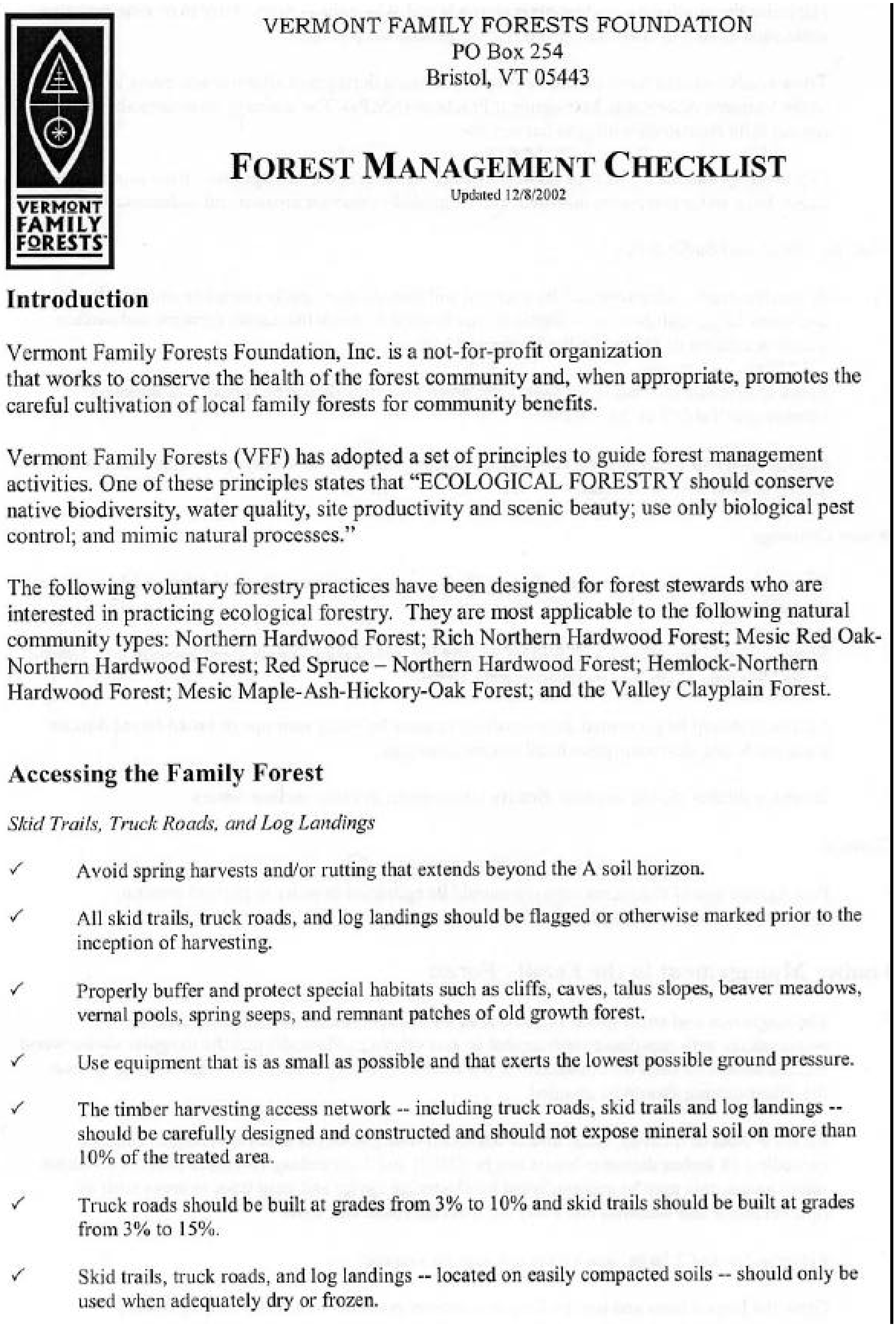
Table 2

Non-Certified Cherry: Based on the range of prices quoted in Table 1.
VFF Sugar Maple: Used market stumpage prices for sugar maple in Vermont and VFF estimated normal market logging rates in September 2001, the time of the project.
Certified Cherry: Based on a range of prices quoted by Babcock Lumber (800) 553-4441 and Kane Hardwood (814-837-6941) for FSC certified black cherry at current prices, which are estimated to be very close to those in September 2001 at the time of the LaForce sale.

Table 4

Non-VFF: Calculated by using VFF's estimates of normal stumpage and logging rates at the time of the timber harvests for LaForce.

Appendix 4: VFF Forest Management Checklist



VERMONT FAMILY FORESTS FOUNDATION
PO Box 254
Bristol, VT 05443

FOREST MANAGEMENT CHECKLIST

Updated 12/8/2002

Introduction

Vermont Family Forests Foundation, Inc. is a not-for-profit organization that works to conserve the health of the forest community and, when appropriate, promotes the careful cultivation of local family forests for community benefits.

Vermont Family Forests (VFF) has adopted a set of principles to guide forest management activities. One of these principles states that "ECOLOGICAL FORESTRY should conserve native biodiversity, water quality, site productivity and scenic beauty; use only biological pest control; and mimic natural processes."

The following voluntary forestry practices have been designed for forest stewards who are interested in practicing ecological forestry. They are most applicable to the following natural community types: Northern Hardwood Forest; Rich Northern Hardwood Forest; Mesic Red Oak-Northern Hardwood Forest; Red Spruce – Northern Hardwood Forest; Hemlock-Northern Hardwood Forest; Mesic Maple-Ash-Hickory-Oak Forest; and the Valley Clayplain Forest.

Accessing the Family Forest

Skid Trails, Truck Roads, and Log Landings

✓ Avoid spring harvests and/or rutting that extends beyond the A soil horizon.

✓ All skid trails, truck roads, and log landings should be flagged or otherwise marked prior to the inception of harvesting.

✓ Properly buffer and protect special habitats such as cliffs, caves, talus slopes, beaver meadows, vernal pools, spring seeps, and remnant patches of old growth forest.

✓ Use equipment that is as small as possible and that exerts the lowest possible ground pressure.

✓ The timber harvesting access network -- including truck roads, skid trails and log landings -- should be carefully designed and constructed and should not expose mineral soil on more than 10% of the treated area.

✓ Truck roads should be built at grades from 3% to 10% and skid trails should be built at grades from 3% to 15%.

✓ Skid trails, truck roads, and log landings -- located on easily compacted soils -- should only be used when adequately dry or frozen.

- ✓ Minimize the number and extent of truck roads and skid trails -- particularly in or near sensitive areas such as stream crossings, protective strips, and steep slopes.

- ✓ Truck roads and skid trails should be properly drained during and after use according to Table 1 in the Vermont Acceptable Management Practices (AMPs). The drainage structures should remain fully functional with post-harvest use.

- ✓ Log landings should: be located on nearly-level, stable ground; be kept away from protective strips; have water diversions installed; and be graded to prevent erosion and sedimentation.

Protective Strips and Buffer Strips

- ✓ Protective strips -- characterized by minimal soil disturbance, nearly-complete canopy closure, and many large, mature trees -- should be maintained between the access network and surface waters according to Table 4 in the Vermont AMPs.

- ✓ Areas of exposed soil that occur within the protective strip should be seeded and mulched according to Table 3 in the AMPs.

- ✓ Stream buffer strips should: be kept free of logging vehicles; have only little or no tree cutting; and be at least 25 feet in width.

Stream Crossings

- ✓ Stream crossings should be restored and non-permanent structures should be removed as soon as possible.

- ✓ Streams should be crossed with bridges or culverts which are properly sized according to Table 2 in the Vermont AMPs and installed at right angles.

- ✓ Sediment should be prevented from reaching streams by using turn-ups or broad-based dips on truck roads and skid trails prior to all stream crossings.

- ✓ Drainage ditches should not feed directly into streams or other surface waters.

Closeout

- ✓ Post-harvest use of the access network should be restricted in order to prevent erosion, compaction, and site disruption.

Timber Management in the Family Forest

- ✓ The single tree and small group (up to one acre) selection methods should be used for communities with gap-phase replacement (e.g. northern hardwoods) and the irregular shelterwood method should be used for communities with stand-replacing disturbance regimes (e.g. spruce-fir). Clear-cutting should be avoided.

- ✓ Retain at least of 6 cavity, snag, and/or decadent, living trees per acre on average, with one exceeding 18 inches diameter breast height (DBH) and 3 exceeding 16 inches DBH. To address safety issues, this may be accomplished by clustering cavity and snag trees in areas such as riparian zones and wetlands and away from access roads and trails.

- ✓ Retain at least of 2 large, down trees per acre on average.

- ✓ Grow the largest trees and use the longest rotations possible within site and log quality limitations. Timber harvesting should generally raise the average (mean) diameter of the residual dominant and co-dominant trees of the forest.

- ✓ Any forest management in natural communities that are ranked as "very rare"(S1) and "rare" (S2) or in natural communities ranked as "uncommon" (S3), "common" (S4), and "very common"(S5) but with little or no evidence of past human disturbance should be reviewed and approved by the VT F&W Natural Heritage Biologists.
- ✓ When planting, use only local sources of native species, plant three or more species, and include deciduous species.
- ✓ When thinning or regenerating stands, favor native species over non-native species.
- ✓ Use natural regeneration to the maximum practical extent.
- ✓ Biological legacies of the forest community -- including coarse dead wood, logs, and snags; trees that are large, living, and old; buried seeds; soil organic matter; invertebrates; sprouting plants; and mycorrhizal fungi -- should be protected to aid in post-harvest recovery and to keep the forest from becoming "oversimplified".
- ✓ Promote the seed bearing capacities of poorly represented members of the forest.
- ✓ Tree felling should be avoided on slopes exceeding 60%.
- ✓ Leave all materials that are less than 3 inches in diameter on the site.
- ✓ Promote a vertical stand structure that includes over-story, mid-story, shrub, and herbaceous vegetation layers.
- ✓ The use of pesticides -- including insecticides, fungicides, and herbicides -- should be extremely limited and only those pesticides accepted by the Northeast Organic Farming Association should be used.
- ✓ The use of genetically modified organisms or "GMOs" should be avoided.
- ✓ Residual stand damage -- including basal wounds, broken and/or scraped tops, and exposed roots -- should be confined to 10% or fewer of the dominant or co-dominant trees.
- ✓ All trees to be removed should be marked prior to the inception of harvest.
- ✓ Average annual harvest volumes should not exceed 70% of the average annual growth.
- ✓ Avoid grazing by domestic animals.

Sensitive and Special Habitat Areas

Harvesting and road building in areas with wetlands, raptor nests, upturned tree roots, seeps, vernal pools, hard/soft mast species, and other unique or fragile natural or cultural sites require additional and specific precautions. Construction of new roads or expansion of the width of existing roads by more than 20% in wetlands will require a permit or review by the Wetlands Office of the Water Quality Division (802) 241-3770. The UVM publication "Wetlands Rules and Regulations: What they mean to your logging operation in Vermont" should be referred to when building or upgrading access and managing vegetation around wetlands.

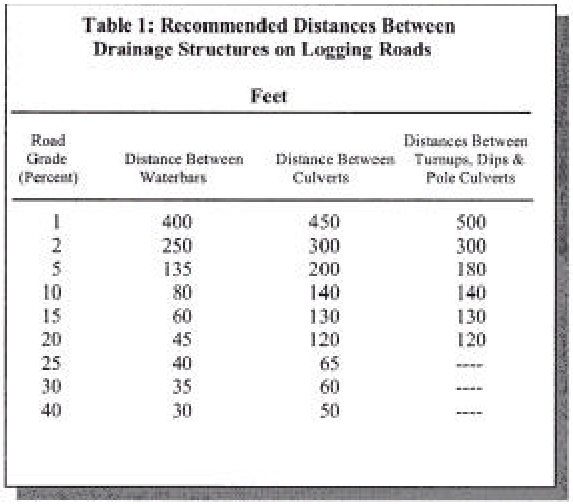


Table 1: Recommended Distances Between Drainage Structures on Logging Roads

Feet

Road Grade (Percent)	Distance Between Waterbars	Distance Between Culverts	Distances Between Turnups, Dips & Pole Culverts
1	400	450	500
2	250	300	300
5	135	200	180
10	80	140	140
15	60	130	130
20	45	120	120
25	40	65	----
30	35	60	----
40	30	50	----

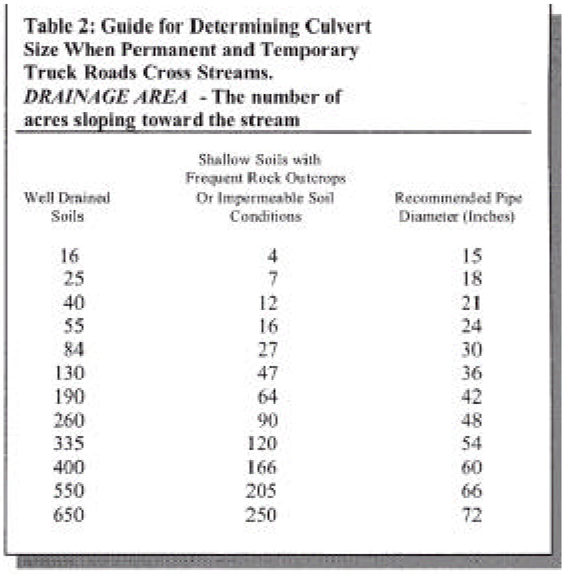


Table 2: Guide for Determining Culvert Size When Permanent and Temporary Truck Roads Cross Streams.

DRAINAGE AREA **- The number of acres sloping toward the stream**

Well Drained Soils	Shallow Soils with Frequent Rock Outcrops Or Impermeable Soil Conditions	Recommended Pipe Diameter (Inches)
16	4	15
25	7	18
40	12	21
55	16	24
84	27	30
130	47	36
190	64	42
260	90	48
335	120	54
400	166	60
550	205	66
650	250	72

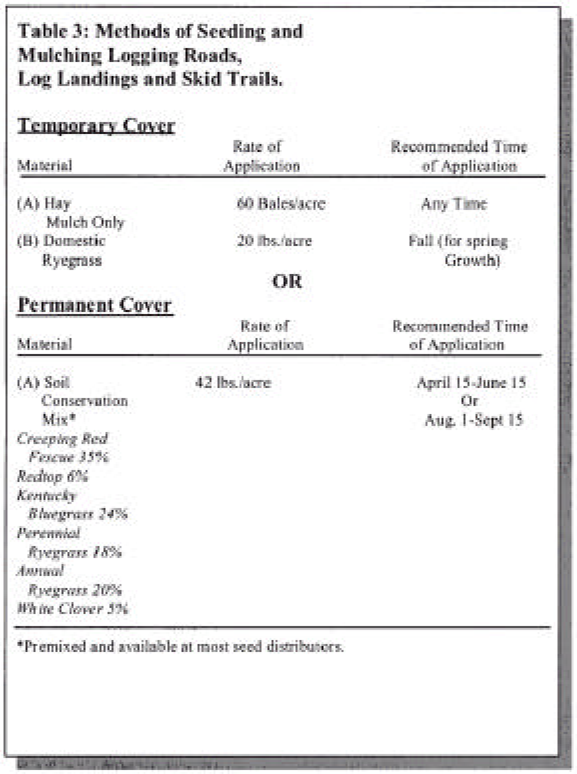


Table 3: Methods of Seeding and Mulching Logging Roads, Log Landings and Skid Trails.

Temporary Cover

Material	Rate of Application	Recommended Time of Application
(A) Hay Mulch Only	60 Bales/acre	Any Time
(B) Domestic Ryegrass	20 lbs./acre	Fall (for spring Growth)

OR

Permanent Cover

Material	Rate of Application	Recommended Time of Application
(A) Soil Conservation Mix* *Creeping Red Fescue 35%* *Redtop 6%* *Kentucky Bluegrass 24%* *Perennial Ryegrass 18%* *Annual Ryegrass 20%* *White Clover 5%*	42 lbs./acre	April 15-June 15 Or Aug. 1-Sept 15

*Premixed and available at most seed distributors.

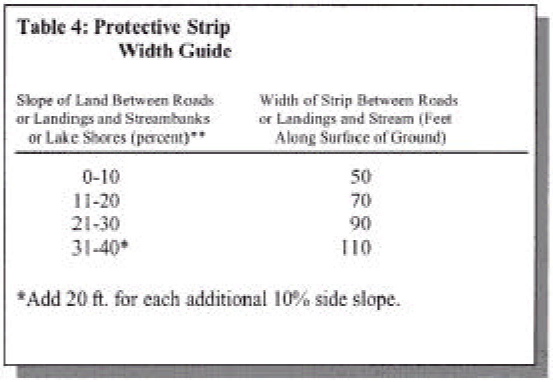


Table 4: Protective Strip Width Guide

Slope of Land Between Roads or Landings and Streambanks or Lake Shores (percent)**	Width of Strip Between Roads or Landings and Stream (Feet Along Surface of Ground)
0-10	50
11-20	70
21-30	90
31-40*	110

*Add 20 ft. for each additional 10% side slope.

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[1] Vermont Family Forests, “Our Mission / Our History,” http://www.familyforests.org/about_sub01.shtml, accessed April 2003.
[2] Vermont Family Forests, “Forest Economics,” http://www.familyforests.org/about_sub04.shtml , accessed April 2003.
[3] Forest Stewardship Council, “About the FSC,” http://www.fscus.org/about_fsc/index.html, accessed April 2, 2003; Vermont Family Forests, “Our Mission / Our History,” http://www.familyforests.org/about_sub01.shtml, accessed April 2, 2003; The Pennsylvania Department of Conservation and Natural Resources: Bureau of Forestry, “Pennsylvania Forest Certification,” http://www/dcnr.state.pa.us/forestry/certification/certification.htm, accessed April 10, 2003.
[4] SmartWood Program, 2001, “Forest Management Public Summary for: Vermont Family Forests,” p. 5. For further information on the specifics of the Northeast Regional standards please see: Forest Stewardship Council, “Standards,” http://www.fscstandards.org/, accessed April 2003.
[5] SmartWood, “The Certification Process,” http://www.smartwood.org/guidelines/index/html, accessed April 19, 2003.
[6] SmartWood, “Chain of Custody Guidelines,” http://www.smartwood.org.guidelines/chain-of-custody-guidelines.html, accessed April 19, 2003.
[7] SmartWood Program, 2001, “Forest Management Public Summary for: Vermont Family Forests,” pp. 2, 6.
[8] Vermont Family Forests, “Ecological Forestry,” http://www.familyforests.org/about_sub03.shtml, accessed April 2, 2003.
[9] M. Lansky, 2002, “Grade Inflation? SCS Certification of Irving’s Allagash Timberlands: A Report for the Sierra Club in May 2002,” http://www.meepi.org/files02/irving.htm, accessed April 2003.
[10] Vermont Loggers Association, “SFI: A Lot of Bull,” http://www.vermontloggers.org/sfi%20page.htm, accessed April 27, 2003.
[11] SmartWood Program, 2001, “Forest Management Public Summary for: Vermont Family Forests,” p. 5.
[12] David Johnston, “Buyer Green,” http://www.housingzone.com/topics/pb/green/survey/buyer.asp, accessed April 2003.
[13] K. Forsyth, D. Haley, and R. Kozak, 1999, “Will Consumers Pay More For Certified Wood Products?,” Journal of Forestry, 9(2):18-22.
[14] C.M. Mater, 1995, “Survey of Manufacturer and Retail Buyer Interest in Certified Wood and Wood Products,” International Journal of Ecoforestry, 11(4): 135-139.
[15] Seth Zuckerman, “Forest Certifier Steps Out on Its Own,” http://www.tidepool.org/dispatches/scs.cfm, accessed April 2003.
[16] Our cost analysis looks only at the actual dollar figures Middlebury paid or would have paid. We did not attempt to calculate the costs of externalities (e.g., greenhouse gas emissions, aesthetics of cutting sites, noise pollution, etc.), but we believe such analyses would be useful and encourage future projects to take up this challenge.
[17] We chose to use non-certified cherry as our hypothetical alternative to the VFF lumber because it represents a kind of opposite decision to the one that actually occurred in that it assumes that the decision-makers perceive the source of their lumber as not very important. This is important for our analysis because it lets us examine the two options and highlight the economic and social implications of how Middlebury College made its decision. Other potential options (e.g., certified cherry, higher cost VFF lumber) are considered in a later section.
[18] Stumpage fees at the Middlebury College site were 1.92 times conventional prices. Stumpage fees at the Callery cut were 1.8 times conventional prices.
[19] Middlebury College Office of Public Affairs, “Middlebury College Wins EPA Award for use of Certified Wood,” http://www.middlebury.edu/pubaff/news_2003/epa_award.html , accessed April 2003.
[20] All information is based on Bread Loaf Wilderness in the Green Mountain National Forest. This forest is representative of northern hardwood forests in the central Green Mountains.
[21] D. Foster, 1992, “Land-Use History (1730-1990) and Vegetation Dynamics in Central New England, USA,” Journal of Ecology, 80(4): 753.
[22] All information is based on the Allegheny National Forest, which is representative of central hardwood forests in the region.
[23] Beginning in the late 1850s tanneries in Pennsylvania extracted tannin from bark, usually from hemlocks, to make animal hides soft and brown. The rest of the tree was used for lumber and paper.
[24] World Wildlife, “Allegheny Highlands Forests,” http://www.worldwildlife.org/wildworld/profiles/terrestrial/na/na0401_full.html, accessed April 2003.
[25] Ibid.

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[26] USDA Forest Service, "Silvics of North America," http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm, accessed April 2003.

[27] Ibid.

[28] USDA Forest Service, "Green Mountain National Forest: Forest Factsheet," http://www.fs.fed.us/r9/gmfl/resource%20management/indianabat.htm, accessed April 2003.

[29] USDA Forest Service, "Biological Evaluation of the Green Mountain National Forest Land & Resource Management Plan for Conservation and Management of Regional Forest Sensitive Species," http://www.fs.fed.us/r9/gmfl/, accessed April 2003.

[30] USDA Forest Service, "Allegheny National Forest Environmental Assessment," http://www.fs.fed.us/r9/allegheny/, accessed April 2003.

[31] J.R. Runkle, 1990, "Gap Dynamics in an *Ohio-Acer-Fagus* Forest and Speculations on the Geography of Disturbance," Canadian Journal of Forest Resources, 20: 632-641.

[32] T.R.Van Deelen, K.S. Pregitzer, and J.B. Haufler, 1996, "A Comparison of Pre-settlement and Present-day Forests in Northern Michigan Deer Yards," American Midland Naturalist, 135: 181-194.

[33] Native Forest Council, "Cutting and Drilling in the Allegheny," http://www.forestcouncil.org/voice/issues/03_winter/allegheny2.php, accessed April 2003

[34] Vermont Family Forests' Forest Management Checklist (see Appendix 4).